

EUROPE

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PREFACE TO THE FIFTH EDITION

I AM deeply grateful to Professor W. Gordon East, M.A., who has kindly supervised this revision of the Fourth Edition of my late wife's book. In particular the statistical tables, both in the text and in the appendices, have been brought up to date and the lists of references at the end of the chapters have been suitably extended.

I am also indebted to Dr. A. F. A. Mutton for much help in this work.

F. G. M.

CAMBRIDGE, 1954.

PREFACE TO THE FOURTH EDITION

SINCE the first edition of this book appeared in 1934, not only have noteworthy additions been made to the geographical literature on Europe, but the ravages of war, as well as revolutionary political, economic, and social changes, have convulsed the continent. Accordingly, it has been necessary to revise the text rather drastically. The most obvious alteration has been the expansion of the section on Eastern Europe from two to seven chapters, in accordance with the increased importance of the U.S.S.R. in European affairs and the new material available on the area. Other chapters which have been completely or mainly rewritten are those on "Vegetation and Soils," "Race, Nationality, and Language," and large portions of the chapters on Italy, the Iberian Peninsula, and Germany, while minor expansions and modifications have been made throughout. New diagrams and photographs have been added.

Owing to the unsettled political and economic state of Europe, and the unexpectedly slow recovery from the devastation and dislocation of the war years, many problems of treatment have arisen. Should Germany, for instance, be treated as a whole or as four zones? The sections on economic geography have presented special difficulties, and accordingly, stress has been laid on tendencies and potentialities rather than on current output figures, though the latter have been given when they seem indicative of permanent trends. Available figures of population distribution are also often unsatisfactory, since few Censuses were taken during the war years.

Somewhat greater stress than previously has been placed on historical trends, but no alteration has been made in the general character of the book with its regional arrangement and its emphasis on the physical background. The book remains essentially an introduction to the regional study of Europe, and for further study of the rich variety of the European scene the reader is advised to consult the books listed at the end of each chapter.

My warmest thanks are due to Professor W. Gordon East, M.A., for reading the proofs and for innumerable helpful comments and suggestions; I am also indebted to N. J. G. Pounds, M.A., Ph.D., to Mrs. F. Anderson, M.A., and to Dr. A. F. A. Mutton for reading part of the proofs.

M. R. S.

PREFACE TO THE FIRST EDITION

THIS book is intended primarily for University students, but the needs of the more general reader have also been kept in mind. The treatment is fundamentally physical, for the author believes that a knowledge of structure is even more necessary to the geographer than a knowledge of anatomy to the artist, and that the physiognomy and form of the earth's surface are incomprehensible without a knowledge of the solid bones of structure beneath. But since this is a geographical and not a geological work, an attempt is made not only to correlate structure with relief, but also relief with climate and all three with vegetation, and so to indicate the main aspects of the whole natural environment in each region. It is not assumed, however, that men are compelled to act in any particular way by their natural environment, but that the various opportunities offered to them by nature can be dealt with in various ways, according to the stage and type of culture which has been attained, the word "culture" here being used in the anthropological sense.

As regards the arrangement of the material, a compromise has been made in the regional section between a division based solely on natural regions, and one based solely on political divisions. In a continent such as Europe with a long historical past one cannot ignore the differences between the various countries which are due in turn to differences of historical or historico-economic development. One country may differ greatly even from its neighbour, not only in language but in the stage of social and economic evolution, so that regions closely similar in physical aspects may yet differ markedly in their human activities and in the use made of their resources. Contrast, for instance, Germany and Poland, Finland and Russia, Spain and Italy. If, however, each of the many countries were to be treated as an isolated unit, one would be apt to lose sight of the broad patterns of structure, relief, and climate which dominate the continent. Accordingly, for the purpose of this book, Europe has been divided into a number of large regions, based primarily on similarities of climate and structure, but also partly on historico-economic affinities. The old-established countries of Europe have also been treated individually in separate chapters.

A detailed regional account of the British Isles has been omitted in view of the easy accessibility of the material in other publications, but a general survey of the structure and climate will be found in the introductory chapters. As, however, the Industrial Revolution in England had so much influence on the rest of the continent, a brief account of its origin and dissemination has been given.

I should like to take this opportunity of expressing my very sincere thanks to those authorities, both in Cambridge and elsewhere, who have given me invaluable assistance in the preparation of this book. Professor O. T. Jones, F.R.S., read the chapter on Structure and Relief and made many helpful suggestions in regard to its contents, and Mr. J. A. Steers, M.A., did the same for the chapter on the Alpine Region. Dr. C. E. P. Brooks read the chapter on Climate and also very kindly had the isotherm maps of Europe drawn for me from the latest material available at the Meteorological Office. Professor E. J. Salisbury, F.R.S., read the chapter on Vegetation, Mr. R. Aitken the chapter on Iberia, Miss I. J. Curnow, Ph.D., the chapter on Greece, and Mr. A. Stevens, M.A., the sections on Fennoscandia and South-Central Europe. I have pleasure also in thanking Professor J. H. Clapham for helpful suggestions in regard to the economic history of Western Europe, and Dr. L. Dudley Stamp for general help and advice. My deep gratitude is due also to Professor F. Debenham for the kind permission he so readily gave me to use the Library and Map Room of the Geography Department of the University of Cambridge.

The photographs reproduced in the book have been supplied for the most part by the various Embassies, Legations, and their Travel Agencies, and in most cases were specially procured for me from the countries concerned. Permission to reproduce the photographs from the *Journal of Ecology* was given by the Editor, Professor A. G. Tansley, F.R.S., and is very gratefully acknowledged. The Spanish photographs were most kindly lent by Professor Hernandez Pacheco of the University of Madrid.

Finally, I wish to express my deep indebtedness to Mr. W. G. East, M.A., and to Miss Alice Garnett, B.A., for undertaking the arduous task of reading the proofs.

MARGARET R. SHACKLETON

(MRS. F. G. MANN)

CAMBRIDGE, 1934.

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PART I

GENERAL SURVEY

INTRODUCTION

GEOGRAPHICALLY speaking, Europe may be looked upon as the most favourable continent for mankind. It contains a greater proportion of land suited to agriculture than any other continent, and, unlike the others, has practically no desert. Its mineral wealth is considerable and varied, and it is especially rich in coal and iron. Its mountain chains, though high, are not impassable barriers, and, moreover, the continent is deeply penetrated by arms of the ocean such as the Baltic, Mediterranean, and Black Seas, so that in proportion to its area it has the longest sea-coast of any continent, and therefore the greatest opportunities for ocean transport, the most economical form of bulk conveyance. Although Europe on the north extends well within the Arctic Circle, yet the winters are remarkably warm for these high latitudes, especially in the north-west, so that settlement and cultivation have here been carried nearer the Pole than anywhere else in the world. The great diversity of environment, especially west of Russia, gave opportunities for the accumulation of different types of experience and for the active exchange of goods and ideas. Insufficient work has been done in the field of socio-geography to enable positive conclusions to be drawn on the relation between environment and civilisation, but the early development of civilisation in Europe, its present thickly populated surface, and the spread of Europeans and European ideas over the whole world, all seem to reflect the favourable nature of the environment for man.

Many people consider that Europe reached the height of its prosperity and prestige in the early years of the present century, and it is certain that the two great recent wars have seriously impoverished the continent. Moreover, with the settlement of Europeans overseas and the acquisition of European knowledge by other peoples, the relative importance of our continent seems bound to diminish. It may, however, be claimed that although other peoples have copied European civilisation there is remarkably little evidence that they have improved upon it. In regard to material progress, any challenge to Europe has come almost entirely

from peoples of European origin now domiciled in other continents, while on the spiritual side no non-European peoples have rivalled our triple heritage of the Greek spirit of free enquiry, the Roman respect for law and justice, and the Christian ideal of love towards God and man.

Any threat to Europe's position as the world's leading continent may be said to come from within rather than from without. The extreme political subdivision of Europe west of the river Dniester, which may be tentatively correlated with its great physical diversity, was rather an asset than a liability in earlier days, and was an important factor in saving Europe on several occasions from control by a crushing despotism. Under modern conditions, however, this political fragmentation is obviously one of Europe's chief

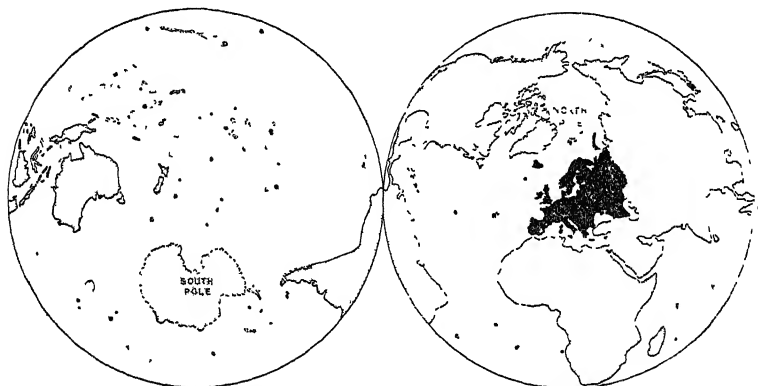


FIG. 2.—LAND AND WATER HEMISPHERES, SHOWING THE FAVOURABLE POSITION OF EUROPE.

sources of weakness, but it is perhaps itself a result of Europe's amazing richness in ideas and the astonishing vitality of its people, for even small nations can point with pride to glorious achievements unsurpassed elsewhere in the world, and so strive to retain their individual identities. Thus, success itself is proving an obstacle to that adaptation to changing conditions which is vital to any organism.

Position.—The most northerly point of the mainland of Europe is Cape Nordkyn in Norway, $71^{\circ} 8' N.$, and the most southerly is Cape Tarifa in Spain, $36^{\circ} N.$ The islands give the continent only a slightly greater extension, the North Cape on the island of Magerö being $71^{\circ} 15' N.$, and the southern coast of Crete about $35^{\circ} N.$ Europe has thus a smaller extension in latitude than the other continents, with the exception of Australasia.

In relation to the disposition of the main expanses of land and water in the world, Europe is fortunate in being placed in the middle of the land hemisphere (*see* Fig. 2), and therefore is centrally situated in the inhabited half of the globe, whereas its antipodes, in the islands of the South Pacific, are situated far from the main centres of human life. Paradoxically, however, Europe combines the advantages of this mid-land position with easy access to other parts of the globe by sea.

Size and Population.—Europe is almost the smallest of the continents, with a total area of 3·8 million square miles. Only Australasia is smaller, while Asia is nearly five times as large.

Europe's population numbers over 500 millions, or no less than a quarter of the world's total. Europe supports more people to the square mile than any other continent, the average being some 120, compared with 70 for Asia, 18 for North America, 13 for Africa, and only 2 for Australia.

Boundaries.—On the north, west, and south, Europe is bounded by the sea, which forms an unmistakable frontier even where narrow, but on the east it merges into the Asiatic mainland, and here its limits are artificial. The eastern boundary was, indeed, extended successively towards the north-east as the knowledge of the area increased, but it has never been considered very satisfactory. The Ural Mountains, stretching from north to south, appear to make a convenient boundary when seen on a small-scale map, but actually they are not very high, are easily crossed in many places, and form a relatively slight physical barrier. They have never formed a political frontier. Between the Urals and the Caspian Sea lies a stretch of plain some 300 miles wide in which there is no natural boundary, and which has repeatedly proved a zone of easy movement for invaders from Asia. In default, however, of better boundaries, the Ural Mountains, the Ural River, and the Caspian Sea may be taken as the eastern limits of Europe, together with the Caucasus Mountains. The latter, which fill the gap between the Caspian and Black Seas, form a climatic divide and a barrier to the movements of peoples, and have more claim to be considered as a natural frontier than the Manych depression, which used to be accepted as the boundary of Europe in the region between these two seas.

CHAPTER I

STRUCTURE AND RELIEF

EUROPE is almost equally divided into two great physical regions, an eastern and a western. Even from a small-scale atlas-map it is possible to perceive the contrast between the great monotonous plain of eastern Europe and the varied relief of the rest of the continent, where there is a rapid alternation of mountain and valley, hill, plain and plateau. This contrast is primarily based on differences of structure, since Europe east of the Carpathians has a simplicity of structure in marked contrast to the complexity of the rest of the continent, and this again is based on differences of geological history, since most of eastern Europe has been a region of great structural stability through vast eras of geological time, whereas western Europe has experienced great earth-storms which have raised up four great mountain systems at different times.

Eastern Europe. This region, sometimes called the Russian platform, is built up of sediments, ranging in age from Palæozoic to Tertiary, which have remained almost undisturbed since the strata were laid down beneath the sea. A small amount of faulting took place and sufficient warping to give rise to gentle swellings and depressions. These slight undulations in turn allowed the work of erosion to denude the more recent deposits from the broad upswellings, thereby exposing wide surfaces of the Mesozoic and Palæozoic¹ strata and partially filling up the depressions, so that before mid-Tertiary times a low plain of denudation was produced which extended across all formations. The whole area later underwent a slight positive movement or bodily uplift *en masse*, which resulted in the present moderate height and in a rejuvenation of the river system—that is to say, the erosive power of the rivers was increased as a consequence of the increased gradient. The general relief of the plain remained, however, almost as monotonous as before. There are, it is true, occasional developments of escarpments, and of hills composed of morainic material deposited in Quaternary times on the edge of vanished ice-sheets, but in general the change of level is so gradual that the effect of sameness remains. The river valleys form the main breaks in the continuity of the plain

¹ See Appendix G, page 509, for table of Geological Sequences

since their courses are often rather deeply incised, the regions over 600 feet high being in parts deeply dissected by gullies; but at lower levels the valleys are not obvious until the brink is almost reached, and they cannot be said to form marked breaks in the landscape.

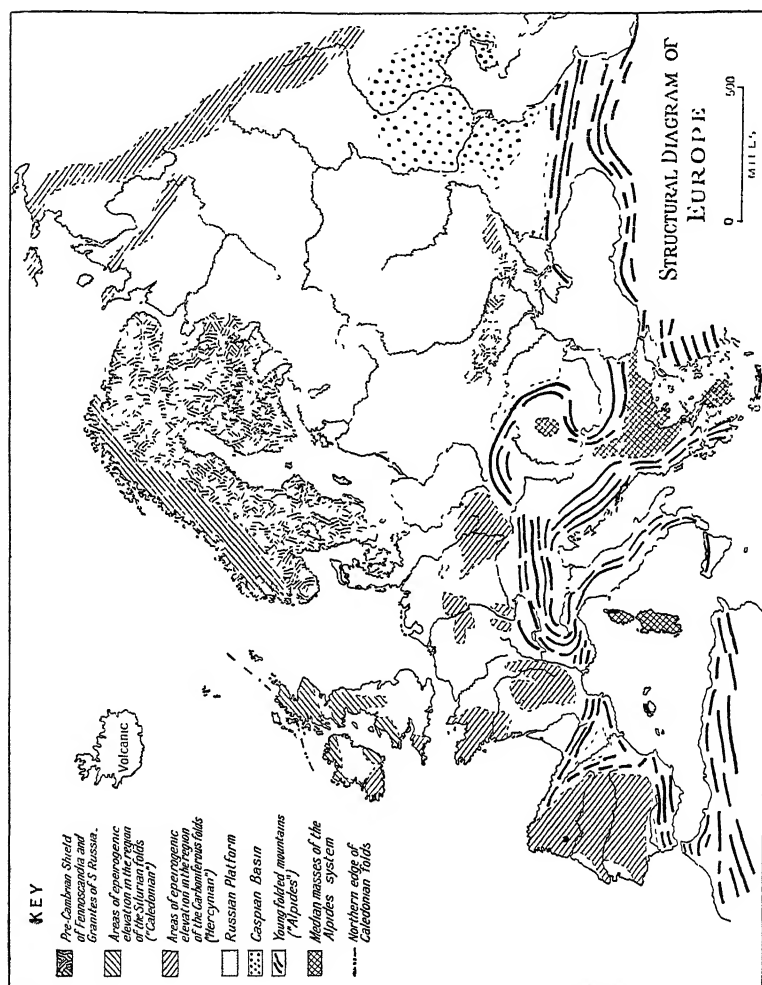


FIG. 3.—STRUCTURAL DIAGRAM OF EUROPE.

The crustal stability of this large area is unique in Europe and contrasts vividly with the complicated geological history of the rest of the continent. Even here, however, there are one or two exceptions. Folded strata are met with in the Donetz plateau in southern

Russia, and in the area between the Rivers Bug and Dnieper denudation has advanced sufficiently far to bring to light in the valleys the ancient gneisses and granites which form the Archæan floor to the platform. Also, the Ural Mountains, which border the eastern edge of the Russian platform, are a folded range raised up at the end of Palæozoic times.

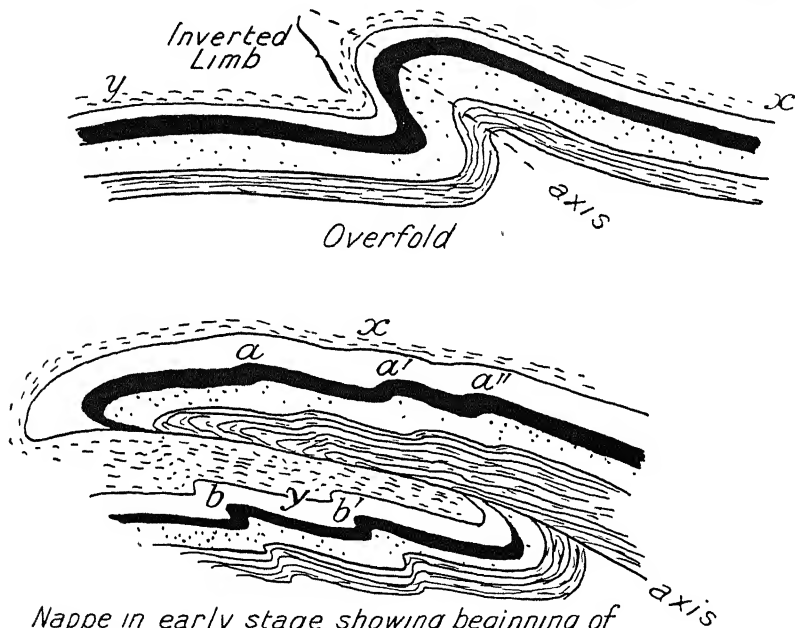
The Folded Mountains of Europe. These belong to four main cycles of folding, the earliest of which took place in Pre-Cambrian times. Next came the Caledonian in late Silurian, and early Devonian times, followed by the Hercynian in Permo-Carboniferous times, and finally by the Alpine in Tertiary times. The mountains raised by the Alpine *orogen* in Eurasia are sometimes known as the *Alpides*, but more often simply as "young folded mountains." Although there is some overlapping, for the most part the great mountain chains were raised up successively farther south, so that the youngest mountains of Europe border the Mediterranean, those of medium age are in mid-Europe, and the oldest are in the north. All except the young folded mountains have been eroded down to their very stumps, and owing to subsequent depression beneath the sea have been covered by great thicknesses of younger material. Their reappearance above sea-level has occurred generally at a late geological period, and may be connected with the great earth disturbance which raised up the young folded mountains in Tertiary times.

Generally speaking, only fragments of the older mountain systems are visible on the surface, while the young folded mountains form long unbroken mountain chains and are generally of higher relief. As the young folded mountains, or European *Alpides*, are the most recent, and have the appearance at the present day once possessed by the older mountain systems of Europe, we begin with a short account of their mode of origin. This will help towards an understanding of the nature of the older ranges.

These young folded mountains comprise the chains bordering the Mediterranean Sea in Spain, in Italy, and in the Balkan peninsula, also the Pyrenees and the great arcs of the Alps and Carpathians, the Balkan range, the Crimean and the Caucasus Mountains. They continue eastward into Asia to the Himalayas and beyond, and the Atlas Mountains of Africa also belong to the same great system.

Before the young folded mountains were raised there existed an ancient sea, called by geologists "Tethys," far wider than the present Mediterranean, lying between and partly upon the old continents of "Africa" and "Euraſia." These two proto-continentſ may be looked upon as consisting of solid resistant masses of old compacted rocks, but the floor of the sea between them was covered with marine

sediments which were relatively much less dense and more flexible. For some reason, as yet not fully explained, the old continents began to move towards one another, and as a result the sediments of the sea between them were buckled into a number of folds. These at first were probably simple, but, as the pressure increased, the folding became more intense, and ultimately successive folds were piled upon one another. They may be described as earth-waves breaking upon the resistant shore of the old continent of Europe.



Nappe in early stage showing beginning of digitation at a, a', a'' and b, b' - Note that inverted limb has disappeared.

FIG. 4.—DIAGRAMS SHOWING THE DEVELOPMENT OF A NAPPE FROM AN OVERFOLD.

The resulting mountains are therefore of extreme complexity; the folds are of the type described as recumbent, in which the lower limbs are completely inverted so as to lie horizontally under the upper limbs. In many cases the folds were torn off from their roots and were thrust forward to the north, and there piled up on top of other folds. Recumbent folds of this type are known as *nappes* in French and *decken* in German, but there appears to be no English equivalent. The process of their formation can best be explained by means of a diagram. (See Fig. 4.)

These *nappes* were first recognised in the Swiss Alps and have since been identified in the Betic Cordillera of Spain, the Apennines, the Carpathians, and in the young folded mountains of the Balkan peninsula. As each *nappe* consists of layers of stratified rock of different types and ages, denudation produces a rapid alternation of outcrop, though long, narrow bands of one type of material run generally in the direction of the length of the chain. In some areas denudation has taken place to such a depth as to expose lower *nappes*, which are revealed in what are called "windows"; in other areas whole *nappes* have been removed altogether. The elucidation of the structure of these young folded mountains is therefore a matter of great difficulty. The geographer, however, who is studying the earth primarily as the home of man, may be content to know the broad outlines of the geological hypotheses referred to above, and to turn to a study of the position and height of these mountains and to the actual material of which they are composed.

The sediments which were folded to form these young mountains were accumulated in seas of moderate depth, and consist mainly of limestones (see Chapter XXIII). The more deep-seated layers, which were, however, subjected to enormous pressure, have generally undergone metamorphism and have become crystalline. Where denudation has advanced sufficiently far these crystalline metamorphic rocks have been exposed, but most of the chains of the Alpides include a considerable proportion of limestones of various ages, ranging from Triassic to early Tertiary. As the folds rose from beneath the sea, shallow-water deposits were laid down, on the outer sides of the ranges, and these consist usually of sandstone and clays known as *Flysch*. In the Western Alps denudation has advanced so far that the original surface beneath all the *nappes* has been exposed in certain areas, whereas in the Apennines there is a large development of rocks of *Flysch* type and of *Cretaceous limestones*. In the Alpides as a whole, however, so much material has been removed by denudation that the mountains would have been reduced to low ranges at the present day if an upward movement *en masse* had not occurred. Such a movement is termed "epeirogenic" in contrast to the "orogenic" or folding movement. It probably took place towards the close of the Tertiary and the beginning of the Quaternary.

The mountains raised by the Alpine movement show a marked tendency in both Europe and Asia to extend in long arcs round interior basins. It is supposed by some that these arcs were formerly more continuous with each other, but have become separated through a sinking of intervening areas. For instance,

the Alps and Carpathians are now separated by the depression traversed by the Danube near Vienna. As, however, the direct evidence lies beneath the sea or beneath great depths of later sediments, reconstruction is a matter of conjecture, though close petrological study of the rocks and of the direction of thrust of the nappes is clearing up some of the difficulties while destroying some of the earlier hypotheses. Thus, it is no longer held that the mountains of the Rif in North Africa were once connected with those of the Sierra Nevada by intervening mountains which have disappeared. Different theories of the connection between the young folded ranges are given in diagrammatic forms. (See Fig. 5.) There are rival theories also to account for the position and direction of the fold ranges, though it is agreed that the spread of the Alps and Carpathians northwards was limited by the solid resistant masses of old rocks which formed the stumps of the Hercynian system. There are various explanations, moreover, of the areas between the folded ranges which were apparently not affected by the Tertiary folds, such as the great depressions of the Hungarian (Pannonian) basin and of the western Mediterranean, or the old mountain masses of the Rhodope in the Balkans. Perhaps Kober's theory of the unfolded "Median Mass" or *Zwischengebirge* is the most convincing (see Fig. 6). In the case of the Alps, however, this unfolded Median Mass does not exist owing to the intensity of the earth movements. Possibly the present width of the Mediterranean is due to a recent northward drift of Europe away from Africa. It is agreed, however, that the regions included within the great arcs of folding are part of the young folded

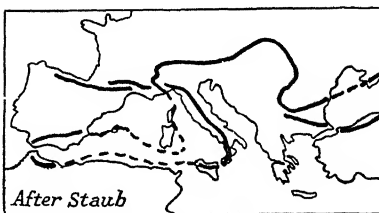
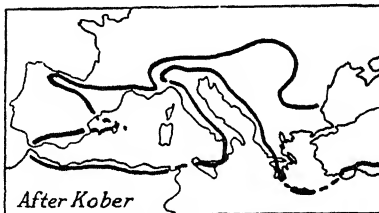
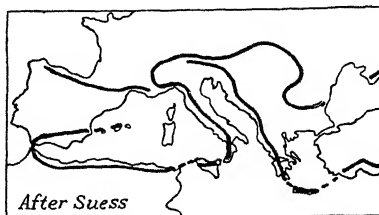
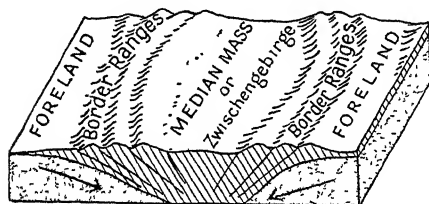


FIG. 5.—SUGGESTED RELATIONSHIPS BETWEEN THE YOUNG FOLDED MOUNTAINS OF EUROPE.

mountain system, though they themselves were not subject to folding in Tertiary times.

As far as elevation is concerned the highest mountains of Europe are to be found in the young folded mountains. Thus Mt. Blanc (15,782 ft.), in France, is the highest peak and the Alps have the greatest average height.¹ The great chains of the young folded mountains have naturally a great influence on the lines of communication in Europe, without, however, being the insuperable barriers which they might appear at first sight. The manner in which they closely border the Mediterranean Sea makes communication inland from the south a difficult matter and concentrates attention on the few gaps which exist between the ranges. Of these gaps there are two of outstanding importance, first that formed by the Rhône-Saône Valley, and secondly that formed by the Dardanelles, Sea of Marmora, and Bosphorus. Besides these



[After Kober

FIG. 6.—BLOCK DIAGRAM SHOWING A "MEDIAN MASS" (ZWISCHENGEBIRGE) BETWEEN FOLDED RANGES.

there are two other important routes which also lead from the southern sea to the northern plains. The first connects the head of the Adriatic with the middle Danube (Pannonian) plain *via* Trieste or Fiume, the latter alternative being more difficult. The second is a long and tortuous route from the Ægean to the same plain *via* the river valleys

of the Morava and Vardar. The Alps themselves by their height and length offer a great obstacle to transport, but they possess a large number of passes, which, if not easy for road construction, at least are not insuperably difficult. Also their high but narrow chains can be evaded by tunnels, which, though of great length in several cases, do not offer difficulties beyond the skill of European engineers, and are not uneconomic in a rich and civilised continent.

North of the young folded mountain zone are fragments of other folded ranges of much earlier geological date which probably were formed in much the same way as the Alpides, and were once equally continuous and extensive. (See Fig. 3.)

Immediately to the north of the young folded zone lie the relics of the Hercynian mountain system which was raised up in late

¹If the Caucasus Mountains are included in Europe, then Elbruz (18,467 ft.) is Europe's highest mountain, and the Alps must take second place for average height.

Palaeozoic times at the end of the Carboniferous period. It extended from what is now western Iberia and Ireland through central France, Germany, Bohemia, Poland and beyond, presumably forming festoons or arcs similar to those of the Alpides. A prolonged period of denudation reduced these mountains to peneplains, and by a gradual invasion of the then continent by the sea, the peneplanated roots of the old mountains were covered by thick deposits of limestones and sandstones of the Permian, Triassic, Jurassic, and Cretaceous periods. The old land-masses were most fully submerged in Cretaceous times, and it is probable that very few remnants of the Hercynian system stood above the sea during that period. At the end of Cretaceous times there was a recovery, and in mid-Tertiary times there were large areas of low peneplain whose surface was in places covered by lagoons, in which were formed brown coal deposits.

A further recovery of land then took place which was associated with the earth disturbances involved in the building up of the Alpides to the south. The earth-storm, however, was generally unable to cause much folding of the resistant stumps of the Hercynian mountains, but they were exposed to severe pressure, to such an extent that numerous great fractures were developed, both in the old rock and in the younger overlying sediments. Sometimes, also, there was slight warping, but generally any disturbances to which they have been subjected were due to uplifts of segments of the old chains as blocks or horsts, accompanied by a general positive movement of the land. As certain segments of the old chains rose higher than others, denudation began to strip off the Secondary and Tertiary sediments from the uplifted portions and to lay bare the old peneplain surfaces of the Hercynian stumps. Owing to the slowness of denudation in these older and more resistant rocks, the former peneplains are still recognisable, and rounded forms are the rule. In the depressions between these horsts or blocks the younger sediments were preserved, usually slightly tilted in conformity with the movement of the Hercynian floor. Erosion, working on comparatively thin strata of different resistances, has led to a great development of scarplands, which are a feature of the more low-lying parts of the Hercynian zone. Consequently there is a great variety of relief in the region affected by the Hercynian system, horsts of old crystalline and metamorphic rocks alternating with plains and low plateaus of clays, sandstones, and limestones.

The Hercynian zone disappears in the west and north under the waters of the Bay of Biscay, the English Channel, and North Sea, and under the recent sediments of the Germano-Polish lowland. It is met with again in the British Isles.

The north-western part of Europe represents the stumps of two still older mountain systems. The Caledonian system is now represented by two main segments, one occupying the north-western part of the British Isles and the other forming the highland backbone of Scandinavia (Norway and Sweden). Formerly these must have been connected across the North Sea. It is not necessary here to trace their long and complicated geological history, which may be treated briefly together with that of the Archæan floor on which they stand. This Archæan floor emerges from beneath the unfolded sediments of the Russian platform on the border between Russia and

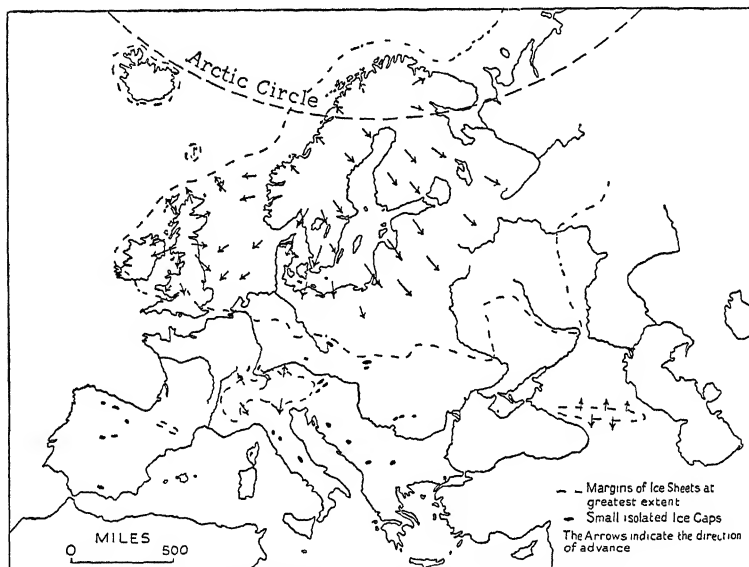


FIG. 7.—THE QUATERNARY GLACIATION OF EUROPE.

Finland, and on the south from beneath the Baltic. It is composed of crystalline rocks such as gneiss, granite, and crystalline schists, and evidently represents the roots of a vast primeval mountain system. Traces of unfolded Palæozoic sediments indicate that strata similar to those of the Russian platform once covered Finland and the greater part of Sweden. On the western borders of Sweden, however, and over the greater part of Norway, Silurian and earlier rocks were folded by the Caledonian movements. It is possible that the greater part of Scandinavia and Finland has been above sea-level since Devonian times, but the present elevation is due to an epeirogenic uplift, probably in middle or late Tertiary times, which tilted

up the western side of Scandinavia to form the present lofty mountains. These, like the horsts of the Hercynian system, are in reality a dissected peneplain, but the tilting was more uniform than in the Hercynian region. The Highlands of Scotland had a somewhat similar history. Old folded mountain chains were eroded to a peneplain which was subsequently uplifted so that the rivers were rejuvenated and the work of erosion hastened, resulting in the formation of deep valleys. A third segment may possibly be identified in the Timan Mountains.

Quaternary and Recent Events. The northern part of Europe, particularly the highlands of Scandinavia and Scotland, preserves abundant evidence of one of the most recent episodes in the geological history of Europe, namely, the great Ice Age of the Quaternary period. The cause of the Ice Age is controversial, but there is no doubt that a great cap of ice, similar to those now covering Greenland and Antarctica, developed over Scandinavia and pushed its way out across the North Sea and Baltic into the bordering lands of Russia, North Germany, Poland, and the eastern coast of the British Isles. Similar but smaller ice-sheets developed in north-west Britain and on other mountainous regions, particularly the Alps.

The main effects of the Ice Age in northern Europe were to sweep great quantities of rock and soil from the highlands of Scandinavia and to deposit masses of unconsolidated material on the lowlands to the south, particularly on those of Denmark, northern Germany, and Poland, whilst a similar process took place on a smaller scale in the British Isles. In the Alps the Ice Age made a profound impression on the range, transforming its former mild curves to the sharp peaks and "horns" that we look upon as typically Alpine. (See Chapter XXIII.)

Since the end of the great Ice Age minor oscillations of level have taken place in numerous areas which show that the European continent is far from stable. The presence of active volcanoes in southern Europe and the frequency of earthquakes in certain regions indicate zones of specially marked instability.

The landforms of any particular area of Europe show the combined influences of the structure on the one hand and of the type and phase of erosion on the other.

REFERENCES

(This short list of books and those given at the end of subsequent chapters are intended for the guidance of students, and are not to be taken as complete bibliographies.)

The Physiographical Evolution of Britain, by L. J. Wills (1929), gives a good account of the building of Europe, its scope being far wider than its title implies. See also *The Unstable Earth*, by J. A. Steers (London, 1932).

Much useful material on land-forms is to be found in *Traité de Géologie Physique*, by E. de Martonne (3 vols. Paris, 1925), in *Physiography*, by R. D. Salisbury (London, 1924), in *The Physical Basis of Geography*, by S. W. Woolridge and R. S. Morgan (London, 1937), and *Principles of Physical Geology*, by A. Holmes (London, 1948).

The Origin of Continents and Oceans, by A. Wegener, translated by J. G. A. Skerl (London, 1924), and *The Surface History of the Earth*, by J. Joly (Oxford, 1925), deal with the causes underlying earth movements. (See also References at the end of Chapter XXIII.)

The Quaternary Ice Age, by W. B. Wright (London, 1937), and *Das Eiszeitalter*, by P. Woldstedt (Stuttgart, 1929), deal at length with the Ice Age in Europe.

Useful books dealing with the composition of the rocks are *The Principles of Petrology*, by G. W. Tyrrell (London, 1926), *Deposition of the Sedimentary Rocks*, by J. E. Marr (Cambridge, 1929), *The Study of Rocks*, by S. J. Shand (London, 1931). *The Elements of Economic Geology*, by J. W. Gregory (London, 1928), deals mainly with the origin and distribution of minerals.

A Palaeographical Atlas of the British Isles and Parts of Europe, by L. J. Wills (London, 1951), should also be consulted.

CHAPTER II

CLIMATE

LYING entirely outside the Tropics, and with but a small proportion of its area inside the Arctic Circle, Europe is often said to have a temperate climate. Since, however, Europe includes places, *e.g.* Moscow, which show a difference of over 50° F. between their mean temperatures in July and January, and a difference of over 140° F. between their absolute maximum and minimum temperatures, the word "temperate" is hardly suitable, and some other term such as "mid-latitude" might be used, though it is better to avoid any such general term, as the climate of a continent of nearly four million square miles must naturally vary greatly from place to place, according to differences of latitude, altitude, the direction of the prevailing winds, and the position in regard to other land-masses and to the ocean.

Large as Europe is, however, it is small compared with the vast unbroken expanses of land and sea which adjoin it, and climatically it is dominated by systems of air circulation which are centred over Asia and the Atlantic Ocean. On charts showing average pressure conditions for winter and summer, Europe is seen to be under the influence of four main pressure-systems, the Icelandic "Low" and the Siberian "High," the Azores "High" and the south-west Asiatic "Low." The Icelandic "Low" is specially intense in winter and the Azores "High" in summer; the Siberian "High" exists only in winter and is replaced by low pressure in summer, while the "Low" of south-west Asia exists only in summer. In outline the average distribution of pressure and its causes appear quite simple, and are explained in every school text-book on the subject; but when this average is considered as being made up of a constantly changing sequence of cyclones and anticyclones—in other words, as representing a dynamic and not a static condition—the whole matter takes on a more complicated aspect.

The real cause of cyclones is not exactly known, but they are believed to originate in the efforts to escape southwards of air accumulated over the Polar regions, especially over Greenland. The cyclones of mid-latitudes, or, as they are more often called, depressions, move usually from west to east and are more frequent in winter than in summer. Their centres show a preference for certain

paths, particularly, as regards Europe, a path which traverses Iceland and skirts the north-west coast of Norway, and, in winter only, a path along the Mediterranean Sea. In summer the latter route has few cyclones, and in both seasons the Alps tend to be a climatic divide. Cyclones are by no means confined to these tracks, however, but cross the continent and enter Russia fairly freely, though they are usually less intense and less frequent over the more continental parts of Europe, as the friction of the land-mass causes the winds to turn inward and the depression accordingly begins to fill up. Almost all the winter precipitation of Europe is cyclonic,

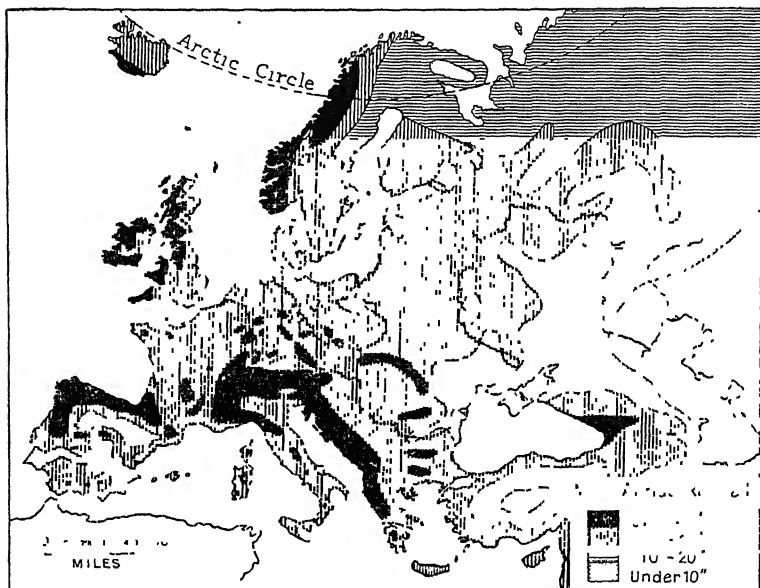


FIG. 8.—RAINFALL MAP OF EUROPE.

though the actual amount varies with relief as well as with the intensity of the cyclone and with the amount of water vapour available, but some winter precipitation on mountainous districts is also purely orographical. In summer, thunderstorm rain augments cyclonic and orographic rain, especially in central and eastern Europe; but thunderstorms are themselves frequently associated with cyclones, particularly with secondaries.

The main climatic characteristic of areas in mid-latitudes traversed by cyclones is the great variety of weather, associated with frequent changes of wind direction, the consequent alternation of warm and cold spells and the frequency of rain. No part of Europe lies

entirely outside the cyclone belt, but southern Europe lies outside it in the summer, when it comes within an anticyclonic zone of steady northerly winds, often known as the Trades, though in the Mediterranean region they are usually only light, gentle airs. The summer climate of the Mediterranean area differs greatly from that of the rest of Europe in being markedly more stable, subject to little change, and of pronounced dryness. The more frequent the cyclones and the greater their intensity the greater is the variety of weather, so that the Atlantic margins have the most changeable climate of Europe, and, apart from the Mediterranean region in

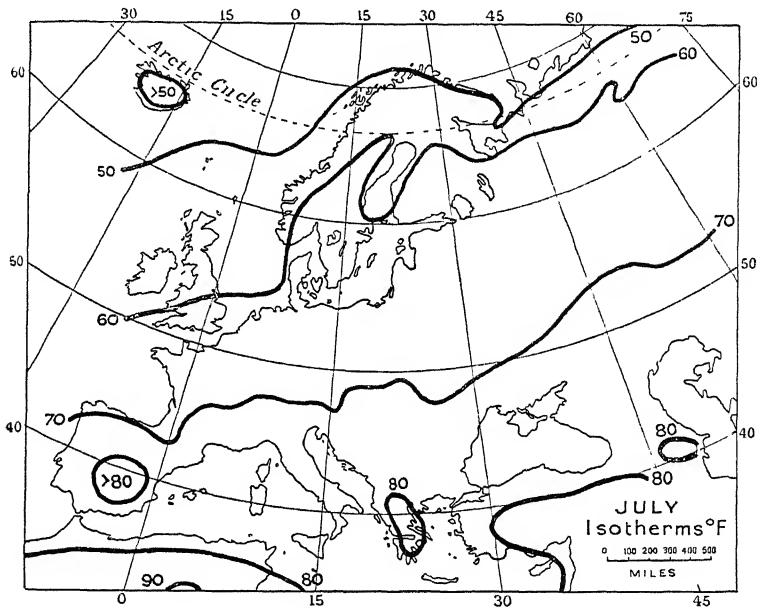


FIG. 9.—JULY ISOTHERMS OF EUROPE

summer, the east of Europe has the least changeable, though the actual range of temperature change is greater.

A division of Europe into regions having a Mediterranean, continental, and oceanic climate régime is a familiar one to all students of geography. No sharp lines mark the boundaries of these divisions, but the region of Mediterranean climate is more sharply marked off from the other two than the oceanic and continental are marked off from each other. This is mainly because the Mediterranean region lies outside the cyclonic belt in summer and so has summer drought, whereas the rest of Europe has precipitation all the year round. This combination of winter rain and

summer drought has given rise to a vegetation association also known as Mediterranean, and where the Mediterranean climatic régime ends the typical vegetation cover also disappears, so that the boundaries of the Mediterranean climate are fairly easily discernible. On the contrary, there is no marked association of vegetation zones with the continental and oceanic climatic régimes, the coniferous and deciduous forest belts being continued from one to the other, though the beech avoids the severe winters of the continental climate.

The change from the oceanic to the continental climatic régime takes place very gradually. The former is distinguished by the small range of temperature between summer and winter and between day and night, the large number of rain-days which are very evenly distributed throughout the year, and by great changeableness. The latter is distinguished by the larger range of temperature (the annual range amounting to 40° F. or more), the smaller number of rain-days, an increasing tendency as one goes eastward for the rainfall to be concentrated in the summer months, and by greater stability. North of the Mediterranean lands, the whole of Europe between the western oceanic margins and Russia may be looked upon as transitional in character between an oceanic and continental climatic régime. It is indeed to some extent a matter of opinion as to what type of climate prevails in central Europe; for instance, an Englishman would probably consider the climate of the Rhine rift valley to be continental in type, whereas a Russian would think of it as oceanic.

The Mediterranean Region. The isobaric map of average pressure in January shows that the Mediterranean basin is a region of low pressure in winter, and that it lies between a tongue of high pressure which extends westwards from the Siberian anticyclone across central Europe and a belt of high pressure which stretches across northern Africa. This low-pressure trough indicates that the Mediterranean Sea forms a favourite path for the passage of cyclones, as already indicated, but they tend to follow the northern rather than the southern shore, so that the European side is rainier than the African side. As the south-west surface air current in cyclones is the chief rain-bringer, it follows also that the western side of each peninsula has a heavier precipitation than the eastern. The existence of rather large expanses of land in the Iberian and Balkan peninsulas tends to hinder the free passage of cyclones, with the result that in winter the interior of these areas is drier than the lands margining the Mediterranean Sea.

The isobaric map of average pressure in July shows the western part of the Mediterranean basin to be under the influence of the Azores anticyclone, while the south-eastern part lies on the outskirts

of the "Low" of south-west Asia. Winds are northerly over the whole basin, and there are rarely any cyclonic disturbances. The winds are, however, usually light, except in the eastern Mediterranean, where the pull of the "Low" of south-west Asia gives great strength to the northerly winds, famed in antiquity as the "Etesian." Except where the strong Etesian prevails, the absence of marked air currents allows the development of land and sea breezes.

Average sea-level temperatures for January vary from about 55° F. in the extreme south (*e.g.* Gibraltar, Sicily) to 44° F. or rather less on the northern coasts, but the high interiors of Iberia, Italy,

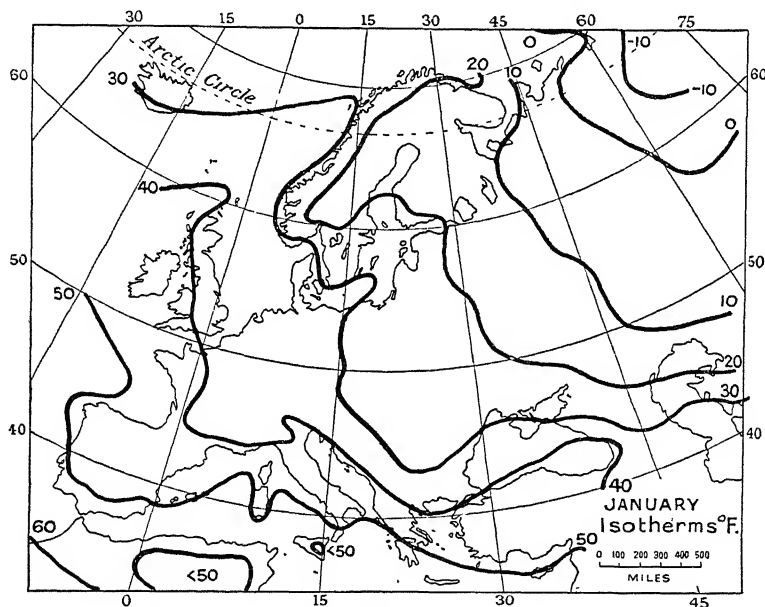


FIG 10.—JANUARY ISOTHERMS OF EUROPE

and Greece naturally have lower temperatures (*cf.* Madrid), while above 4,000 feet or so in the south and 3,000 feet in the north the average January temperature is usually below freezing, and precipitation comes in the form of snow. In summer the average sea-level temperatures for July are high, reaching over 80° F. in southern Spain and about 80° F. in the southern parts of the other peninsulas, and rarely falling below 70° F., even the mountains being regions of heat and drought. Unlike the temperatures, which show no great contrasts, the actual amount of rainfall varies very much from place to place. The south-eastern coasts of the peninsulas have generally a low rainfall, often less than 16 inches, but

the mountains on the north-western coasts have exceptionally heavy rainfall, especially the high Dinaric Alps; Crkvice, above the Bay of Kotor, having an average annual rainfall of 183 inches, which is about the same as that on the exposed mountains of north-west Europe.

Fig. 11 (p. 28) shows the approximate limits of the Mediterranean climatic régime, and the tables at the end of this chapter give the most important climatic statistics for various towns. There are, however, important aspects of the climate of an area which are not very obvious from the study of such tables, or which are apt to be misinterpreted by dwellers in a different type of climate. For instance, it is usually assumed by residents in other parts of Europe that the Mediterranean climate is an enervating one, but Algeria has been described as "a cold country where the sun is hot," and the same may be said of most of the Mediterranean lands for nearly three-quarters of the year. The omnipresence of high mountains provokes a generous fall of snow in the winter months, and the snow often lies well into the spring. For instance, the mountains of the Abruzzi (*c.* 42° N.) often carry snow in May, Mt. Olympus (*c.* 42° N.) and Mt. Etna (*c.* 38° N.) also have a snow-cap for the greater part of the year, and the name of the Sierra Nevada ("Snowy Mountains," *c.* 37° N.) in the south of Spain tells its own story. Any winds coming off the snows are naturally very cold, even when not intensified locally by peculiarities of relief as in the case of the Bora and Mistral, which are particularly strong cold winds blowing from the north at the head of the Adriatic and down the Rhône valley respectively. Even in summer the coast-lands usually enjoy cool sea breezes by day, while the strong northerly winds of the eastern Mediterranean are so dry that they feel cool. Moreover, a large percentage of the population lives at considerable altitudes, for the coastal plains are frequently swampy and malarial and tend to be avoided except by a few big cities. The facts that isotherm maps usually show temperatures reduced to sea-level, and that most of the statistics available refer to towns at low altitudes, have probably helped to give many northern people an erroneous idea of the real temperature conditions of the Mediterranean lands.

Although the Mediterranean winters have certain similarities to those of southern England and western France, in that January temperatures are much the same in the northern part of the Mediterranean as in Cornwall and Brittany, and the frequency of cyclones brings rain and constant changes of weather, yet there are considerable differences. There is a smaller number of rain-days, and though the rainfall is usually more torrential, the concentration results in clearer skies and more sunshine than in the rest of Europe.

Alsowing to the lower latitude the winter days are longer, the sun higher in the heavens and therefore more powerful. Hence the attraction to tourists of the Mediterranean winter climate, though the winter rainfall may actually be greater in the Mediterranean, *e.g.* sunny Naples has 22 inches in the winter six months compared with 19 inches in the Scilly Isles. As late as Easter, however, it is rarely comfortable to sit in the shade on the Riviera coast, and Florence and Rome may be equally chilly, although it is usually hot in the sun, especially if shelter can be obtained from the wind.

The Region of Oceanic Type of Climate. The oceanic type of climate is familiar to most English readers and need not be described in detail. It may be noted, however, that the prevailing westerly winds of north-west Europe are due to the fact that the majority of the cyclones crossing this area have their centres along the track which passes to the north of Scotland and Norway, and that winds on the southern side of a cyclone are westerly. These westerly winds come off an exceptionally warm ocean, whose warmth is caused partly by the west winds themselves, since they bring the warm water from the Gulf Stream over to the shores of north-west Europe in the form of warm layers of surface water. The influence of these winds is felt far inland, especially in winter, when the land is cold compared with the sea. Their influence is felt, indeed, far beyond the limit of the region delimited on the map as oceanic, though in the north the Scandinavian mountains act as a barrier and cause a somewhat abrupt change between the stormy, changeable climate of western Norway and the more stable, more extreme climate east of the chain. The exceptionally high winter temperatures, for the latitude, prevailing over the British Isles, over Norway and over the adjacent seas, give rise to the "winter gulf of warmth"; the courses of the 30° and 40° isotherms (see Fig. 10) are particularly noteworthy.

The Continental Climatic Province. The area with a continental climatic régime embraces practically the whole of European Russia,¹ with the exception of the southern shores of the Crimea, which have a Mediterranean régime. The average pressure in January is higher than elsewhere in Europe, indicating that cyclones are either fewer or less intense. Actually both surmises are true, though enough depressions penetrate the region to give frequent, though slight, precipitation. The greater part of Russia lies on the southern side of the Icelandic-Norwegian cyclone track, so that winds are mainly westerly, but Russia is sufficiently remote from the warm Atlantic for

¹The terms "European Russia" or merely "Russia" are employed instead of the cumbrous expression "The European section of the U.S.S.R."

the winds to have lost much of their warming influence, so that winter temperatures are much lower than farther west, and precipitation is mainly in the form of snow. Depressions also reach Russia along the Baltic and North German plain. Southern Russia, on the other hand, comes mainly under the influence of the Mediterranean-Black Sea cyclone track, on whose northern side it lies, so that winds are mainly easterly and north-easterly, and as they come from the cold land-mass of Central Asia, even southern Russia has winter temperatures below freezing, though the winter season is notably shorter in the south, the average duration of the snow cover ranging from three weeks on the Black Sea coast to nine months on the shores of the Arctic Ocean. Only under the shelter of the Yaila Mountains in the Crimea, and at the south-western foot of the Caucasus Mountains in the latitudes of the northern Mediterranean, does the January temperature reach an average above freezing-point, while at Archangel the January temperature averages only 7.7° F.

Contrary to general belief, Russia is cloudier in winter, which is the season of least precipitation, than in summer. This cloudiness is due to the greater frequency of cyclones, but the small actual amount of water-vapour in the cold air means that precipitation is slight, though as it comes in the form of snow it is very much in evidence. The rigours of the Russian winter have, however, often been exaggerated. Historical causes have kept the Russians backward and until recently the people have acquired neither the mechanical devices nor the material organisation to cope with their winter climate. It should be remembered that Kiev and Moscow have mean January temperatures very similar to those of Toronto and Ottawa respectively and very much higher than that of Winnipeg, and as an American writer says: "There is no horror in a winter blizzard moving at thirty miles an hour at a temperature of thirty below zero, if you see it from the windows of a Winnipeg club."

In summer, European Russia lies on the outskirts of an area of relatively low pressure which covers the greater part of Asia. There is a gradual diminution of pressure from west to east, but the isobars are wide apart and there is no marked gradient, with the result that conditions are favourable to the development of thunderstorms, which bring most of the summer rain.

Summer (July) temperatures vary from about 75° F. in southern Russia to about 65° F. over the greater part of central Russia, and even Archangel has a July temperature of 60°. The range between winter and summer temperatures is everywhere great. Summer is the season of heaviest rainfall in Russia, but in the absence of mountains total falls are not great, being under 10 inches for the year in south-eastern Russia, about 20 inches over the greater part

of central Russia, but decreasing again to about 10 inches in the Arctic regions.

It may be noted that the southern part of Russia has insufficient rain and the northern part insufficient heat for tree growth, so that the region with a continental régime has three great vegetation types, tundra, forest, and steppe. It may be strongly contrasted, therefore, with the region of Mediterranean climate, which has a very similar vegetation over the whole area, apart from differences of altitude. From a geographical point of view this great difference in natural environment in Russia, caused by differences in the amount of insolation and rainfall from north to south, is of more importance than the similarity of the climatic régime.

The Transitional Climate of Central Europe. Central Europe may be looked upon climatically as a battle ground where oceanic and continental influences struggle for the mastery. In contrast to the open winters of western Europe, winters here are usually sufficiently cold to cause work on the land to cease. Summers are warmer and winters colder on an average than at similar latitudes in western Europe, so that the range of temperature approaches continental standards. Rainfall is rather more concentrated into the summer months and less spread out through the year than in the oceanic margins. As in the whole of the cyclone belt, however, weather is very variable, and though the changes are not usually so rapid as farther west, yet, as in Russia, their intensity is greater owing to the central position between two areas, whose climate, and particularly temperatures, often differ markedly, especially in winter. The combat between "Russian" and "oceanic" winters is particularly obvious on the Germano-Polish plain. For instance, Osterode in former East Prussia had 123 days with snow-cover in 1908, but only 23 days in 1903; Magdeburg had 78 days snow-cover in 1917 and only 13 in 1911; Cologne had 54 days snow-cover in 1917 and only 4 days in 1910 and 1914.

As in eastern Europe, the great extension in latitude of the area gives rise to marked differences of actual climate. It is obvious that the climate of the plain of Lombardy with its mulberry trees and rice-fields is different from that of, say, Luleå at the head of the Gulf of Bothnia, where it is impossible to grow fruit trees and very difficult to grow cereals. Moreover, the climate of the Alps is not the same as that of the Scandinavian highlands, the more southerly latitude of the former giving a much longer winter day, much warmer winter sunshine, and a shorter cold season, the difference being neatly shown by the fact that the Alps are Europe's main winter-sports ground at Christmas and the Scandinavian highlands at Easter

REFERENCES

Climate, by C. E. P. Brooks (London, 1929), contains a very considerable bibliography. *Climatology*, by A. A. Miller (London, 5th ed., 1947).

The Climates of the Continents, by W. G. Kendrew (Oxford, 1922 and later editions).

Handbuch der Klimatologie, by J. von Hann (Stuttgart, 3 vols., 1908, 1910, 1911).

Die Klimate der Erde, by W. Köppen (Berlin and Leipzig, 1923).

MEDITERRANEAN REGION

| No. | Station | Lat. N. | Long. | Height in feet | Days of | |
|-----|------------|---------|------------|-------------------|---------|------|
| | | | | | Rain | Snow |
| 1 | Gibraltar | 36° 6' | 5° 21' W. | 53 | 84 | — |
| 2 | Madrid . | 40° 24' | 3° 41' W. | 2,149 | 95 | 4 |
| 3 | Barcelona | 41° 23' | 2° 8' E. | 136 | 70 | 3 |
| 4 | Marseilles | 43° 18' | 5° 23' E. | 246 | 101 | 2 |
| 5 | Rome . | 41° 54' | 12° 29' E. | 207 | 102 | 2 |
| 6 | Naples . | 40° 52' | 14° 15' E. | 489 | 112 | 1 |
| 7 | Malta . | 35° 54' | 14° 31' E. | 183 | 77 | — |
| 8 | Athens . | 37° 58' | 23° 43' E. | 351 | 99 | 6 |

MEAN TEMPERATURE—DEGREES F.

| No | Jan | Feb | Mar. | Apr. | May | June | July | Aug | Sept | Oct | Nov. | Dec | Year |
|----|------|------|------|------|------|------|------|------|------|------|------|------|------|
| 1 | 55.0 | 55.9 | 57.4 | 60.6 | 64.7 | 69.5 | 73.4 | 74.9 | 72.0 | 65.7 | 60.5 | 56.1 | 63.7 |
| 2 | 40.3 | 43.7 | 47.7 | 53.8 | 61.0 | 69.6 | 77.2 | 76.6 | 67.3 | 56.1 | 47.3 | 41.0 | 56.8 |
| 3 | 46.9 | 48.7 | 51.3 | 55.9 | 62.0 | 68.8 | 74.2 | 74.7 | 69.5 | 62.3 | 53.9 | 48.5 | 59.7 |
| 4 | 44.3 | 46.3 | 49.9 | 54.9 | 61.2 | 67.5 | 71.8 | 70.6 | 66.4 | 58.6 | 51.2 | 45.7 | 57.4 |
| 5 | 44.6 | 46.8 | 50.9 | 56.7 | 64.4 | 70.9 | 76.1 | 75.6 | 69.6 | 61.7 | 52.7 | 46.4 | 59.7 |
| 6 | 46.6 | 48.4 | 51.3 | 56.5 | 63.9 | 70.2 | 75.2 | 75.2 | 70.5 | 63.1 | 54.7 | 49.1 | 60.1 |
| 7 | 53.5 | 53.5 | 55.2 | 58.6 | 64.1 | 70.8 | 76.5 | 77.3 | 74.2 | 69.1 | 62.0 | 56.1 | 64.2 |
| 8 | 48.4 | 49.4 | 52.1 | 58.6 | 66.2 | 74.2 | 79.9 | 79.6 | 73.4 | 66.0 | 57.3 | 52.1 | 63.2 |

AVERAGE RAINFALL—INCHES

| No. | Jan. | Feb. | Mar. | Apr | May | June | July | Aug | Sept | Oct | Nov | Dec | Year |
|-----|------|------|------|-----|-----|------|------|-----|------|-----|-----|-----|------|
| 1 | 5.1 | 4.2 | 4.8 | 2.7 | 1.7 | 0.5 | 0.0 | 0.1 | 1.4 | 3.3 | 6.4 | 5.5 | 35.7 |
| 2 | 1.3 | 1.3 | 1.6 | 1.6 | 1.7 | 1.3 | 0.4 | 0.5 | 1.5 | 1.8 | 2.0 | 1.6 | 16.6 |
| 3 | 1.4 | 1.5 | 1.8 | 1.9 | 1.7 | 1.5 | 1.0 | 1.3 | 3.0 | 3.1 | 1.8 | 1.4 | 21.4 |
| 4 | 1.7 | 1.4 | 1.9 | 2.2 | 1.7 | 1.1 | 0.7 | 0.8 | 2.4 | 3.8 | 2.8 | 2.1 | 22.6 |
| 5 | 3.2 | 2.7 | 2.9 | 2.6 | 2.2 | 1.6 | 0.7 | 1.0 | 2.5 | 5.0 | 4.4 | 3.9 | 32.7 |
| 6 | 3.7 | 2.9 | 2.8 | 2.5 | 2.0 | 1.4 | 0.6 | 1.1 | 2.9 | 4.6 | 4.5 | 4.4 | 33.4 |
| 7 | 3.2 | 2.2 | 1.5 | 0.9 | 0.4 | 0.1 | 0.0 | 0.1 | 1.3 | 2.9 | 3.6 | 3.7 | 19.9 |
| 8 | 2.0 | 1.7 | 1.2 | 0.9 | 0.8 | 0.7 | 0.3 | 0.5 | 0.6 | 1.6 | 2.6 | 2.6 | 15.5 |

MEAN TEMPERATURE—DEGREE F.

| No. | Jan. | Feb. | Mar. | Apr. | May | June | July | Aug. | Sept. | Oct. | Nov. | Dec. | Year |
|-----|------|------|------|------|------|------|------|------|-------|------|------|------|------|
| 1 | 11.7 | 10.4 | 16.7 | 28.6 | 39.2 | 53.1 | 59.0 | 54.7 | 45.7 | 34.3 | 23.0 | 14.0 | 32.5 |
| 2 | 26.8 | 26.4 | 29.7 | 38.1 | 47.7 | 57.4 | 61.9 | 59.4 | 52.5 | 43.3 | 34.9 | 28.8 | 42.2 |
| 3 | 30.0 | 33.1 | 37.9 | 47.5 | 56.8 | 63.1 | 66.0 | 64.8 | 58.3 | 48.6 | 38.7 | 33.1 | 48.2 |
| 4 | 26.4 | 28.6 | 35.2 | 46.2 | 57.2 | 63.0 | 65.7 | 63.5 | 56.1 | 46.4 | 36.0 | 29.8 | 46.2 |
| 5 | 29.1 | 32.9 | 39.7 | 49.8 | 59.0 | 64.9 | 68.2 | 66.9 | 59.9 | 50.0 | 39.2 | 32.4 | 49.3 |
| 6 | 26.2 | 30.6 | 41.0 | 52.2 | 62.2 | 68.9 | 72.9 | 72.0 | 63.5 | 52.9 | 39.7 | 30.9 | 51.1 |
| 7 | 37.0 | 40.5 | 46.7 | 54.8 | 63.5 | 70.6 | 75.5 | 74.0 | 67.4 | 57.8 | 46.8 | 39.8 | 56.2 |

AVERAGE RAINFALL—INCHES

| No. | Jan. | Feb. | Mar. | Apr. | May | June | July | Aug. | Sept. | Oct. | Nov. | Dec. | Year |
|-----|------|------|------|------|-----|------|------|------|-------|------|------|------|------|
| 1 | 1.5 | 1.1 | 1.0 | 1.0 | 1.2 | 1.5 | 1.8 | 2.1 | 2.4 | 2.2 | 2.0 | 1.4 | 19.2 |
| 2 | 1.4 | 1.2 | 1.4 | 1.4 | 1.5 | 1.7 | 2.6 | 3.0 | 1.9 | 1.8 | 1.8 | 1.9 | 21.6 |
| 3 | 1.7 | 1.4 | 1.6 | 1.5 | 1.9 | 2.3 | 3.0 | 2.3 | 1.7 | 1.7 | 1.7 | 1.9 | 22.7 |
| 4 | 1.2 | 1.1 | 1.3 | 1.5 | 1.9 | 2.6 | 3.0 | 2.9 | 1.9 | 1.6 | 1.5 | 1.5 | 22.1 |
| 5 | 1.5 | 1.3 | 1.8 | 2.0 | 2.8 | 2.7 | 3.1 | 2.7 | 2.0 | 1.9 | 1.8 | 1.8 | 25.4 |
| 6 | 1.3 | 1.1 | 1.6 | 1.7 | 2.5 | 3.5 | 2.7 | 2.0 | 1.6 | 1.7 | 1.9 | 1.6 | 23.1 |
| 7 | 1.6 | 1.6 | 2.0 | 2.4 | 2.9 | 3.0 | 2.3 | 2.5 | 2.8 | 3.6 | 2.7 | 1.9 | 29.3 |

EASTERN EUROPE

| No. | Station | Lat. N. | Long. | Height in feet | Days of | |
|-----|-------------|---------|------------|-------------------|---------|------|
| | | | | | Rain | Snow |
| 1 | Archangel . | 64° 35' | 40° 36' E. | 22 | 174 | 99 |
| 2 | Leningrad . | 59° 56' | 30° 16' E. | 16 | 173 | 72 |
| 3 | Moscow . | 55° 46' | 37° 40' E. | 512 | 169 | 82 |
| 4 | Kasan . | 55° 47' | 49° 8' E. | 266 | 121 | 54 |
| 5 | Kiev . | 50° 27' | 30° 30' E. | 600 | 153 | 56 |
| 6 | Astrakhan . | 46° 21' | 48° 2' E. | -45 | 56 | 31 |
| 7 | Odessa . | 46° 29' | 30° 44' E. | 214 | 88 | 21 |

MEAN TEMPERATURE—DEGREES F.

| No. | Jan. | Feb. | Mar. | Apr. | May | June | July | Aug. | Sept. | Oct. | Nov. | Dec. | Year |
|-----|------|------|------|------|------|------|------|------|-------|------|------|------|------|
| 1 | 7.7 | 9.1 | 18.0 | 29.8 | 41.0 | 53.4 | 60.3 | 56.3 | 46.4 | 34.2 | 21.7 | 11.7 | 32.5 |
| 2 | 18.0 | 17.6 | 24.4 | 36.3 | 48.4 | 58.5 | 63.3 | 60.1 | 51.1 | 40.5 | 30.2 | 21.6 | 39.2 |
| 3 | 13.3 | 14.2 | 23.2 | 37.9 | 53.8 | 61.3 | 66.0 | 61.9 | 51.6 | 40.5 | 27.7 | 19.2 | 39.0 |
| 4 | 7.5 | 11.3 | 20.8 | 38.3 | 55.4 | 63.3 | 67.8 | 63.3 | 51.8 | 38.1 | 24.3 | 13.5 | 37.9 |
| 5 | 21.2 | 23.5 | 31.1 | 44.4 | 58.5 | 63.3 | 66.7 | 64.8 | 56.1 | 45.1 | 33.3 | 25.7 | 44.4 |
| 6 | 19.2 | 22.8 | 32.7 | 47.8 | 63.5 | 72.5 | 76.1 | 73.8 | 62.6 | 49.5 | 36.0 | 26.6 | 48.6 |
| 7 | 27.3 | 28.9 | 36.7 | 47.4 | 60.1 | 67.6 | 72.6 | 71.1 | 62.2 | 52.3 | 39.9 | 32.0 | 49.8 |

AVERAGE RAINFALL—INCHES

| No. | Jan. | Feb. | Mar. | Apr. | May | June | July | Aug. | Sept. | Oct. | Nov. | Dec. | Year |
|-----|------|------|------|------|-----|------|------|------|-------|------|------|------|------|
| 1 | 0.9 | 0.7 | 0.8 | 0.7 | 1.2 | 1.8 | 2.4 | 2.4 | 2.2 | 1.6 | 1.2 | 0.9 | 16.8 |
| 2 | 1.0 | 0.9 | 0.9 | 1.0 | 1.6 | 2.0 | 2.5 | 2.8 | 2.1 | 1.8 | 1.4 | 1.2 | 19.3 |
| 3 | 1.3 | 1.2 | 1.4 | 1.4 | 1.8 | 2.6 | 3.2 | 3.1 | 2.2 | 2.1 | 1.7 | 1.6 | 23.6 |
| 4 | 0.9 | 0.7 | 0.8 | 0.9 | 1.4 | 2.4 | 2.2 | 2.1 | 1.7 | 1.5 | 1.3 | 1.0 | 16.9 |
| 5 | 1.4 | 1.2 | 1.7 | 1.7 | 2.0 | 2.9 | 3.2 | 2.2 | 1.8 | 1.9 | 1.6 | 1.6 | 23.2 |
| 6 | 0.5 | 0.4 | 0.4 | 0.7 | 0.7 | 0.8 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.6 | 6.6 |
| 7 | 1.0 | 0.8 | 1.1 | 1.0 | 1.2 | 2.2 | 1.9 | 1.3 | 1.3 | 1.2 | 1.3 | 1.2 | 15.5 |

CHAPTER III

VEGETATION AND SOILS

THE natural vegetation of Europe has been so much interfered with by man that few traces remain of the unmodified covering except in the higher and more unfavourable latitudes and altitudes. Even uncultivated areas have often been affected to such an extent by man's activities (*e.g.* by fire and animal grazing) that the vegetation may have altered greatly since man's interference began. The plant associations, indeed, are constantly undergoing changes in response to both biotic and climatic changes. Were man's interference to cease, it is unlikely that the original vegetation would re-establish itself in exactly the same form. Nevertheless, the "natural," "characteristic," or "climax" vegetation, as it is variously called, is essentially a result of climatic and soil conditions, and, indeed, both natural and cultivated vegetation are influenced by these factors. In turn, the broad zones of soil are themselves dependent on climate, though minor variations of soil owe much to the underlying rocks.

Five main belts of vegetation may be distinguished (*see* Fig. 11): the tundra, the coniferous forest, the mixed forest in which deciduous trees predominated, the Mediterranean, and the grasslands. In addition a small belt of semi-desert occurs in the south-east, and patches of Alpine flora are found on the higher mountains throughout the continent.

The Tundra Zone. This cold, treeless belt, sometimes known as the "Arctic Steppe," lies mainly within the Arctic Circle in a narrow zone bordering the Arctic Sea, but it sends tongues southwards in the Scandinavian, the Timan, and the Ural Mountains.

As the soil is frozen for the greater part of the year and the subsoil is permanently frozen, only shallow-rooted plants can grow, and this precludes the growth of trees, with the exception of dwarf polar willows and of birches in some places. The latter grow only a few inches high and cling closely to the ground so that they are barely recognisable as trees. The vegetation, although entirely low-growing, varies considerably from place to place, according to the type of rock and to slight variations in relief and exposure. Lichens, including the well-known "reindeer moss," cover much of the drier, sandy sections; the badly drained areas develop a

peat-bog flora where sphagnum and other mosses are the dominant vegetation. The most favoured areas develop summer meadows, but on the other hand many of the rocky stretches are almost devoid of vegetation. The northern berry-bearing bushes, *e.g.* cloudberry, blueberry, and cranberry, occur only in very favoured places. Agriculturally the region is practically useless, though it affords pasture for small numbers of reindeer.

There is no sharp boundary between the Tundra and the Taïga, or Coniferous Forest, which succeeds it. A few isolated willows and birches begin to appear, then stunted conifers hung with

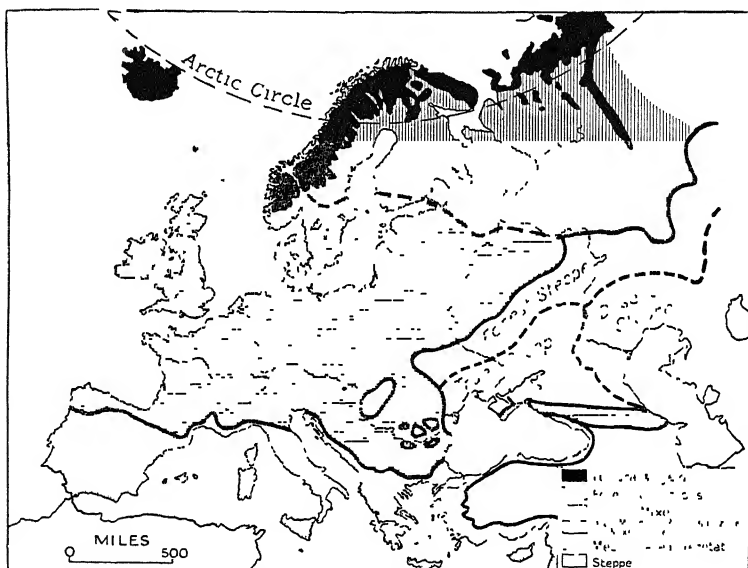


FIG. 11.—VEGETATION ZONES OF EUROPE.

bearded lichens, until eventually whole woods can be seen. The Tundra appears to be encroaching on the forest, at least in the Russian lands, for along the southern edge of the Tundra many dead trees can be seen, or trees whose tops have died off.

The Tundra soils are formed under conditions of excessive humidity, for although the precipitation is low it is far greater than the evaporation. The soils are of the peat-bog type and are characteristically very acid.

The Taïga or Coniferous Forest Zone. The name Taïga is of Siberian origin, but has come to be widely used to denote the Northern Coniferous Forest, as distinct from coniferous forests of

other climatic regions. The zone extends southwards from the Tundra to about 62° N. in Norway, Sweden, and Finland, but dips still farther southwards to about 53° N. in the Urals. The highlands of Scandinavia interpose a long tongue of tundra-like vegetation into this belt. Owing to the short growing season, the relatively low summer temperatures, and the acid soils of this region, agriculture is very difficult, only a few clearings have been made, and the forest remains the chief European reserve of timber. Spruce (*Picea excelsa*) and Scots pine (*Pinus sylvestris*) predominate, with Siberian species, e.g. larch (*Larix sibirica*), Siberian spruce (*Picea sibirica*) and fir (*Abies sibirica*), being also found in Russia. One deciduous tree is widely found in this belt, namely, the silver birch (*Betula alba*), whilst alders (*Alnus glutinosa*) and rowans (*Pyrus aucuparia*) occur to some extent.

In spite of the vast extent of the Taïga, the tenure of the coniferous trees is not so secure as appears at first sight. Peat-bogs are a marked feature of the vegetation of this zone and they appear to be spreading at the expense of the forest. Peat-bogs, in which sphagnum predominates, are favoured by the abundance of water-logged areas, but in these cool humid northern lands they can actually invade areas which were previously dry or dryish. A small patch of moss will absorb rain or snow and spread out into a carpet which successfully prevents the aeration of the soil, and so the trees are gradually killed. Moreover, when the coniferous trees are destroyed by forest fires or felling operations their place is often taken by birch or alder. It is interesting to note that there is considerable competition among the conifers themselves; for instance, the spruce in Norway has spread widely at the expense of the Scots pine and is still advancing, the reason being that the spruce seeds every three or four years, whereas the pine seeds only about every six or seven years.

As regards agriculture, only the hardier cereals and roots, such as barley, oats, and potatoes, can be cultivated, and these with difficulty. Fruits trees are generally absent, but berry-bearing bushes are numerous. Hay grows well in the long days of the northern summer, but is difficult to dry.

The soils of the Coniferous Forest zone are termed *podsols*, or ash-grey soils. Actually the colour of the surface layer varies from whitish-grey to greyish-brown. The soil shows three well-marked horizons; the top-soil is leached by the melting of the heavy snow-cover, which has much the same leaching effect as heavy rain. The iron in the top-layer of soil is thus removed and re-deposited as sesquioxides in the middle-layer, which may often show a hard compacted stratum or "pan." Incidentally this impermeable

“pan” is greatly conducive to water-logging and thus to the development of peat-bogs. The surface soil is shallow, acid, and poor in humus; it is also poor in texture, tending to be heavy when wet and caking when dry, like our English clays, which indeed are sometimes podsolised.

The Zone of Mixed Forest. This once covered the greater part of Europe except in the two regions described above, and in the belts of true steppe and Mediterranean vegetation. Broad-leaved, deciduous trees predominated, but conifers were found to some extent on the poorer, especially the sandier, soils and in the mountainous districts. In Great Britain, however, there were only two native coniferous trees, the Scots pine and the yew (*Taxus baccata*), of which only the former formed forests of any extent. Unlike the coniferous forest, the Mixed-Forest belt has been mainly cleared for agriculture, and generally only the poorer soils or steep mountain slopes are now forest-covered, and these have often been re-afforested. One result of man's interference with nature in this belt has been to reduce the proportion of deciduous trees in favour of the conifers, for two reasons. Since the deciduous trees grew mainly on the better soil they have been largely cut down to make way for ploughland, while within the last hundred years or so re-afforestation schemes have concentrated on the quick-growing and less exacting conifers which give a speedier economic return.

The soils of this belt vary from *podcols*, where coniferous trees predominate, to the characteristic brown forest soils of western and central Europe, which are less acid and have a higher humus content. Where the underlying rock is calcareous a type of soil develops which is lime-accumulating and dark in colour; it is known as *rendzina* in Poland, where it was first studied, and it approximates in type to the *chernozem* or “black-earth” (*cf.* p. 35).

Owing to the wide extension in latitude, from about 42° N. to 62° N., and the change from the oceanic climate of the west to the continental climate of the east, this zone gives opportunity for a great variety of cultivated crops. The chief cereal is wheat in the central and southern parts of the belt, with barley and oats also very generally grown. Rye tends to be the most important bread cereal in the northern part of the belt, especially round the Baltic and in Russia. Maize is of some importance along the southern margin. Root crops are generally grown, including sugar-beet and potatoes. Cultivated grasses, including clover, are very important, and in the wetter north-west meadows cover a large area, much of which may at one time have been occupied by other types of vegetation. A large number of fruit trees are grown, such as the apple, pear, and plum, and small fruits also flourish. The

vine is widely grown south of about 50° N. The milder southwestern portion of the belt shows a particularly rich variety of crops.

Intruding into this zone there are outlying patches of the grassland belt in the plains of Hungary, Romania, and Bulgaria, while the higher parts of the Alps, Pyrenees, and Carpathians rise above the forests into the zone of Alpine flora.

The Mediterranean Zone. The natural vegetation of the Mediterranean lands consists of plants which can either withstand or evade the summer drought. The characteristic Mediterranean trees, for instance, have small leaves, low stature, and other devices for

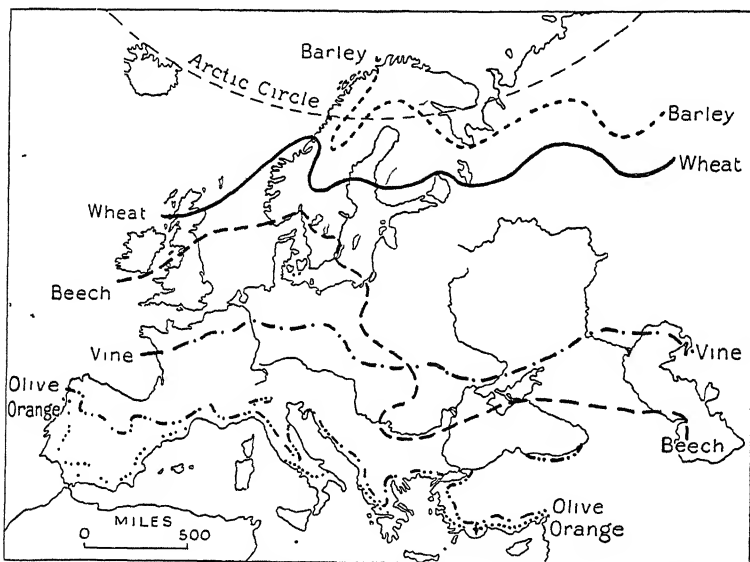


FIG. 12.—NORTHERN LIMITS OF CERTAIN PLANTS AND TREES IN EUROPE.

Note, however, isolated regions of olive culture in northern Italy and on the southern shore of the Black Sea.

checking loss of moisture, but each tree needs a considerable area of root space to supply it with sufficient water in the dry season, and the characteristic Mediterranean "forest" grows in open formation and is hardly worthy of the name. It easily degenerates into scrub, known under various names, such as *maquis* in Corsica, *macchia* in Italy, and *garrigue* in southern France. Only a few kinds of trees have been successful in surviving this rather unfavourable climatic régime. Such are the olive, holm oak (*Quercus ilex*), cork oak (*Q. suber*), and various conifers, such as *Pinus maritima*, *P. halipensis*, and the stone pine (*P. pinea*). The evergreen

character prevents loss of time in resuming growth. On the mountains having considerable rain, and where the summer drought is less marked, deciduous trees occur, specially the sweet chestnut (*Castanea sativa*), and on the higher slopes various conifers, but the latter have been largely cleared. Once the vegetation cover was removed from the mountains the torrential rain swept away the soil cover, which is not easily renewed in this climate. Hence the predominance of bare rock in mountainous districts.

Various heaths and aromatic herbs such as lavender, myrtle, rosemary, thyme also manage to survive the drought, and these shrubs, like the trees, also have devices to prevent loss of moisture. Grass, however, withers in early summer and seldom grows in close formation except in the swampy deltas and coastlands. The cultivated grasses, of which barley and wheat may be native, similarly evade the drought by ripening in May, June, or early July, according to latitude and altitude. Bulbs evade it by lying dormant in summer and flowering in winter and spring.

Owing to the scarcity of grass the rearing of cattle is unimportant, but the aromatic herbage provides food for sheep and goats, though it has little fattening value and often gives the flesh a peculiar taste. Transhumance is widely practised, the animals being moved to the mountain pastures in summer and to the lowland grazing grounds in winter, since the mountains are usually under snow in winter and the lowland herbage burnt up in summer. The sheep and goats, in nibbling the leaves of young trees, are among the many enemies to the re-establishment of the Mediterranean woodlands. Owing to the absence of cattle there is a general absence of dairy produce, although sheep's and goat's milk is used to some extent.

The cultivated Mediterranean fruits are generally not natives of the basin, nor, as a rule, are they perfectly suited to the climate. The orange is apparently a native of the summer-rain lands of southern China and is therefore not naturally adapted to summer drought, and usually it needs irrigation here. The closely allied lemon is confined to the southern margins of Europe, being even more sensitive to cold than the orange, and also generally needing irrigation. Even the vine is often irrigated in the Mediterranean zone, and except in regions of rather heavy rainfall is usually grown in hollows where it can take advantage of all the moisture available; it is, of course, widely grown outside the region of Mediterranean climate. Peaches and apricots are also not indigenous; in fact, the only two indubitably native fruits appear to be the olive and the pomegranate. The olive forms a useful guide to the limits of the Mediterranean climate on the north, but the mountains inside the region are also too cold for its cultivation. The three traditional

food-staples, however, throughout the Mediterranean zone are bread, wine, and olive oil.

The characteristic soil of this zone is a brown forest soil, which is similar to that of the Mixed-Forest zone, but, where the underlying rock is calcareous, a bright red soil, known as *terra-rossa*, often occurs, as in Apulia, on the sides of the lower Rhône valley, and in smaller patches elsewhere. This is a heavy but fertile soil, which though limited in distribution provides a most remarkable colour contrast with the white limestone which forms the parent-rock, and which frequently outcrops above the pockets of *terra-rossa* in the form of hills.

The Grassland or Steppe Zone. This belt stretches in a south-west to north-east direction and lies mainly in Russia. Actually this zone contains three sub-sections which reflect slight but significant differences of climate. Along the northern and western margins of the zone there is a transitional belt between the true grasslands and the Mixed-Forest zone which may be termed the *wooded-steppe*; along the southern and eastern margins there is a transitional belt towards the desert which may be termed the *poor* or *non-tillable steppe*; the main belt consists of a region where grasses and other herbaceous vegetation flourish, but where trees will not grow except along watercourses or in places where water is supplied artificially. The term *prairie* might advantageously be applied to this broad middle zone to avoid confusion with the non-tillable steppe, but unfortunately there is no general agreement among geographers as to the nomenclature of these three sub-zones.

Generally speaking, trees do not grow in the steppes because conditions of physiological drought prevail during both the arid months of late summer and the freezing months of winter. Grasses, as well as many flowering plants and bulbs, can lie dormant during these inclement periods and rush into rapid growth during the spring and early summer.

The *wooded-steppe*, also known as the *forest-steppe*, has a curious history. It seems clear that this area was once covered by herbaceous vegetation consisting of steppe grasses and flowering plants, but that it was invaded by deciduous trees in Post-glacial times. The predominating trees were oaks, maples, and limes of various kinds, together with the common ash, with a second storey of smaller trees and shrubs, such as the cherry, sloe, hazel, dog-rose, etc. These formed thick and extensive woods, though there appear to have been considerable patches in which steppe vegetation prevailed. The grasslands of the Middle Danubian basin and most of the grasslands of Romania belong to the wooded-steppe which, however, attains its greatest extent in Russia (see Fig. 11). The

clearing of the woods took place gradually, possibly in early historic times in the Middle Danubian basin, and as late as the seventeenth century in Russia; it has been carried so far that nowadays few trees remain, except round some of the villages, though re-afforestation has taken place on a small scale in Hungary, while a few patches of natural woodland remain in Walachia. The wooded-steppe now resembles the true-steppe in appearance, both having been brought under cultivation, the main difference being that trees, including fruit trees, can be grown successfully without irrigation in the wooded-steppe, provided that sufficient care is given in the early stages. The soil of the wooded-steppe strongly resembles that of the true-steppe, but is technically known as "degraded" *chernozem*. (See below.)

The true-steppe or prairie. In this zone the precipitation is lower and the evaporation higher than in the wooded-steppe, so that the total amount of moisture available is smaller and the droughty periods are longer. The characteristic vegetation consists of steppe grasses (species of *Stipa*, *Andropogon*, *Chrysopogon*, etc.) together with brightly coloured flowering plants in great variety, among which the members of the composite, legume, crucifer, umbellifer and labiate families are conspicuous. Tubers and bulbs, such as a yellow dwarf iris (*Iris pumila*) and the white Star of Bethlehem (*Ornithogalum tenuifolium*), also occur. The natural vegetation of the steppe springs into life after the snow has melted, usually during April, and presents a brilliant carpet of colour until about June, when the plants begin to wither and dry up; for the rest of the summer and during autumn the steppe takes on the appearance of a semi-desert, while in winter, of course, the whole region has a mantle of snow varying in thickness from a thin powdering to a substantial covering.

The chief cultivated crops here, as in the wooded-steppe, are cereals, especially wheat, together with barley, oats, and rye, with maize in the warmer portions. Sunflowers (for oil), sugar-beet, and tobacco are of considerable importance. Crops other than annuals are difficult to grow. For instance, although the summers are long and warm enough for the vine in the south-western part of the zone, the stumps (*ceps*) have to be protected in winter under mounds of earth. The chief fruit is the melon, while vegetables include cucumber, pumpkin, gherkin, paprika, and onions. Crop failures through drought occur more frequently in the true-steppe than in the wooded-steppe.

Before being brought under cultivation the steppe was the domain of cattle-keeping horsemen, and the steppes are eminently suited to livestock though little natural pasture remains. The only

uncultivated parts of the steppe are those patches which are either too saline or too sandy for cultivated crops, and these had, and still have, a somewhat different vegetation from the true-steppe.

The characteristic soil of the true-steppe consists of "black-earth" or *chernozem*.¹ This soil, which was first studied in Russia, hence its Russian name, meaning "black," is a deep, friable loam. It is a non-leached, lime-accumulating soil, and therefore contrasts strongly with the acid soils of the Coniferous Forest zone. The top-soil is deep and very dark in colour, owing to the high percentage of humus which resulted from the decaying steppe-vegetation over a period of countless years, though the chemical changes involved are somewhat obscure. The *chernozem* is highly fertile and generally easy to work, though it tends to become sticky when wet and powdery when dry. In the wooded-steppe the *chernozem* shows slight signs of leaching, *i.e.* it approximates to the brown forest soils, but from the point of view of agriculture it is almost indistinguishable from the true *chernozem*.

The uncultivated steppe. This occurs round the northern end of the Caspian Sea, where the annual precipitation drops below 10 inches. The region is named *desert-steppe* in Fig. 11. Most of it carries seasonal grazing, though the grasses and other herbaceous plants do not form a continuous covering as in the true-steppe, but tend to grow in tufts, with patches of bare earth between them. Towards the south-east large areas are almost completely devoid of vegetation, and throughout the zone a good deal of the surface is impregnated with salts of various kinds where only a few salt-loving plants can survive. The many sand-dunes also have a scanty but specialised flora. The characteristic soils are known as "Chestnut," but their colour is greyish-brown, resembling the bark of the Spanish chestnut tree and not the colour of horse-chestnuts, which the name perhaps suggests to English readers. They are unleached, lime-accumulating soils, and the humus content is moderately high, so that they are relatively fertile under irrigation, though the possibilities of the latter are limited.

¹ Pronounced "chernozyem."

REFERENCES

A. F. W. Schimper's great volume on *Plant Geography*, translated by W. R. Fisher (Oxford, 1903), has relatively little on Europe, and the most useful work is M. E. Hardy's *The Geography of Plants* (Oxford, 1925). Also, Marion I. Newbigin's *Plant and Animal Geography* (London, 1936) contains much useful material. See also, "The Loess Regions of Central Europe in Prehistoric Times," by A. Garnett, *Geog. Jour.*, Vol. CVI.

On soils, see *Soils*, by G. W. Robinson (London, 1932); *The Great Soil Groups of the World and their Development*, by K. D. Glinka (Ann Arbor, 1937).

Two articles on the "Agricultural Regions of Europe," by O. Jonassen, in *Economic Geography*, Oct., 1925, and Jan., 1926, may be profitably consulted.

CHAPTER IV

RACE, NATIONALITY, AND LANGUAGE

THE territorial division of Europe among some twenty-five to thirty independent countries, each with its own separate political, military, economic, and social organisations, forms one of the essential aspects of the geography of the continent, especially in its effect on the various branches of human, including economic, geography. Each of these countries, with but few exceptions, is divided from all the others by differences of language, a fact which renders difficult the exchange of ideas, hinders the spread of knowledge, and limits the growth of understanding between the various peoples. Moreover, each country can emphasise its separate entity by import duties on goods, and by restrictions on the entry of persons from other countries. The number and extent of the different countries of Europe have varied very much from time to time (the study of these changes being one of the chief preoccupations of European history), but generally speaking, the tendency until the end of the nineteenth century was for smaller countries to be amalgamated to form larger ones, for dialects to lose their more outlandish forms and to merge together into standard languages, and for internal hindrances to the free movement of goods and peoples to be abolished. Towards the end of the nineteenth century, nevertheless, and in some cases earlier, a reaction set in, principally because some groups of people, who had been included in large states, had not been assimilated into the main body, and on one ground or another were discontented with their lot. This separatist movement found its main opportunity during the political upheavals which accompanied and followed the War of 1914-18, and which resulted in the break-up of the Austro-Hungarian, Ottoman (Turkish), Russian, and German empires. The movement had, however, been active in south-eastern Europe for some time, and had already resulted in the partial break-up of the Turkish empire during the nineteenth and early twentieth centuries. It had also been manifest in other countries, *e.g.* Ireland, Catalonia, and Flanders. In nearly all cases, the people who broke away, or wished to break away, spoke a different language from the official one of the state; but the claim to independence was sometimes based on differences of so-called race, and sometimes on differences of nationality, a convenient but vague term, very difficult to define.

At the present day the greater part of Europe is organised politically on a national basis, in contrast to the imperial organisation which prevails over most of Africa, though the nationalist idea has spread also to those parts of the world where it was hitherto unknown, *e.g.* Egypt, Burma, Indonesia, and India. Since the concept of nationality has had and is still having so much influence on territorial distributions, a brief examination of the idea is necessary.

A word or two may first be said in regard to the prevailing popular confusion between the two terms "race" and "nationality," a confusion which the widespread but inexact use of the word "ethnic" has served to increase. Many maps which purport to show ethnic distributions merely show language distributions, and the term "ethnographic frontier" has become a most dangerous phrase. In spite of the scientific flavour of the word "ethnic," it is often used to denote three totally distinct ideas, largely because in popular opinion, race, language, and nationality are believed to coincide, a confusion of thought which goes back to antiquity.

Anthropologically, the study of race is concerned solely with physical characteristics, and nothing is implied about the cultural, historical, or linguistic connections of the people studied. There are various methods of physical classification. Until the theory of blood-groups was established round about 1925, it was usual to classify populations by physical measurements, *e.g.* of the skull and stature, and by the colouring of the skin, hair, and eyes. The size of the skull and the type of features were given a varying degree of weight by different authorities. The most important of these criteria were the measurements of the skull, expressed as a cephalic index, *i.e.* the ratio of maximum breadth to maximum length, partly because this is believed to be least susceptible to environmental change, and partly because records of cephalic indices are reasonably abundant and reliable.

Despite the new evidence afforded by blood-groups, these outward physical characteristics are still valuable for classification purposes, though it must be understood that anthropologists are concerned with averages rather than with individuals. Everyone knows how members of a single family can vary in stature, colouring, and other physical characteristics; for instance, one brother may be tall and dark, another short and dark, while a third may be short and fair, and so on, while an examination of the cephalic indices may also indicate considerable differences. As Morant has pointed out, a tall, fair man with a low cephalic index may have a very similar pedigree to that of a short, dark man with a high cephalic index.

This variation in physical type among closely related people is due to the fact that the hereditary constitution in the biological sense consists of a very large number (running into thousands) of units of matter known as *genes*. Moreover, each kind of *gene* may exist in a number of sub-types. One should therefore expect variability rather than uniformity among the human species, and where uniformity exists to any marked degree it seems to be the result of long isolation and in-breeding. The history of the European peoples has not usually been favourable to such isolation; on the contrary, there has been a great amount of movement and interbreeding among them, in both historic and prehistoric times.

The modern population of Europe is believed to be descended from people who began to enter the continent during the later stages of the great Ice Age and from subsequent immigrants; the whole period is variously estimated at twenty to forty thousand years, during which the immigrants were able to wander about. As all these people belonged to a single species, *Homo sapiens*, which is the only surviving species of *Homo*, there was no biological obstacle to their interbreeding. The earliest European representatives of *Homo sapiens* were people in the Palæolithic, or Old Stone, stage of culture, and their skeletons show that they were far from uniform in their cephalic indices or stature, though many of them were tall, had craggy features and big brain-cases. As the edge of the ice-sheet retreated northwards and climatic conditions improved in Europe, the climate worsened by becoming much drier and more desert-like in northern Africa and south-western Asia, so that the inhabitants of these latter places moved out into Europe and elsewhere. These people showed considerable variety of size, but were all long-headed or dolichocephalic, and are classed together as Mediterranean. Not much is known about the colouring of these prehistoric people, but they were probably rather dark, resembling the modern inhabitants of the Mediterranean islands and shore-lands. It is believed that the dolichocephalic fair, or fairish, people of north-west Europe are a variant of these Mediterranean colonisers, some of whom possessed the *gene* of blondness. According to C. S. Coon and other anthropologists, interbreeding took place between the Mediterranean intruders and the late Palæolithic people to give great variety of long-headed and medium-headed (mesocephalic) types among the present-day populations of the north-west fringes of Europe, e.g. of Ireland and Norway.

Between the dolichocephalic and mesocephalic peoples of southern and northern Europe interposes a wedge of people, who are mainly broad-headed, or brachycephalic. This wedge is widest in Russia,

where it merges into the great mass of broad-headedness in northern and central Asia, and it tapers westward into south-western France, where it practically disappears. These broad-headed people, however, are far from being homogeneous in stature, colouring, or facial features, and although the term "Alpine" is sometimes applied to all of them, it is a misleading term, because it conceals the very great variety to be found among them. The people of central France, southern Germany, Austria, Czechoslovakia, and Hungary tend to be of medium height and colouring, but the people of the Balkans, Romania, and southern Russia tend to be darker, and often resemble the Mediterranean people facially. In northern Germany, Poland, and central Russia, however, though still broad-headed, the people are mainly fair, and it is a fact that most of the fair-haired people of Europe are not long-headed, but are brachycephalic (with a cephalic index over 80).

It is clear that the bulk of the present-day population of Europe is brachycephalic, though the bulk of the ancestral stock, as revealed in burial grounds and ossuaries, was dolichocephalic. There are at least two schools of thought to account for this change; some anthropologists hold that round-headedness derives from intruders from Asia Minor, where it appeared rather early, while others hold that it developed *in situ*, possibly through interbreeding with late Palæolithic types, or from genetic and other causes which are imperfectly understood. There is no doubt, however, that the physical characteristics of Europeans are not static, but are still in process of change.

It will have been gathered from the above paragraphs that racial types do not correspond with national, linguistic, or political groupings. The evidence of blood-group investigations reveals a similar lack of identity between blood-groups and cultural or political distributions. On passing from east to west in Europe there is seen to be a gradual change in the proportion of people belonging to the four main blood-groups. This grouping does not correspond with any frontiers; for instance, there is a closer resemblance in the blood-group relationships between the people of south-eastern Germany and the people of the Danubian lands (Czechs, Hungarians, etc.) than between those of south-eastern and north-western Germany.

The widespread belief that the people of any one country are of unique and homogeneous race has acquired immense political importance in recent years, but it can be shown to be erroneous. The people of all the major nation-states of Europe include a great variety of physical types. For instance, the people of France include a sprinkling of fair dolichocephals in the north, a large

body of brachycephalic types in the middle, and a sprinkling of rather brunette dolichocephals in the south; the Germans show just as much variety, while the Italians, far from belonging entirely to the Mediterranean type, as might be imagined, are largely brachycephalic, though the coloration varies from very brunette in the south to a considerable amount of blondness in the north. Conversely, no political grouping possesses a monopoly of any particular physical type, though it is well known that the belief, however mistaken, held by a group of people that they are of homogeneous race has often greatly fostered their sense of cohesion, or in other words, their national spirit.

The connotations of nationality are so complex and variable that all attempted definitions are bound to be vague. A national spirit, however, may be said to be a feeling of coherent solidarity prevailing in a group which for generations has experienced a similar mode of life, and has thus acquired a common tradition. This feeling of group-consciousness is not, of course, new, it is perhaps merely a tribal spirit on a larger scale, but a nation differs from a tribe in the size and complexity of the group, most of whose members can never come into contact with each other or with their ruler. National consciousness seems to have come to the fore in England and France about the time of the Hundred Years' War, when English was becoming the accepted language of the ruling classes in England in place of French. Before that time the old Roman idea of the unity of the civilised world had held sway and the dream of reviving the old Roman Empire in the new guise of the Holy Roman Empire was still cherished for many centuries, especially by the Church, who wished to see a peaceful Europe in which all men should be citizens of Christendom; a noble ideal, but one doomed to failure in the presence of many competing, semi-barbaric groups and the absence of any adequate system of communication. The germ of the national spirit may be traced in many countries in the late Middle Ages—for instance, in Dante's aspirations for a united Italy—but the sword was all-powerful and the imperial or dynastic idea usually prevailed. It was only in the nineteenth century that a really new twist was given to the idea of nationality, and this came with the rise of the notion that those who wanted to join together in a national group had a definite right to do so, a democratic idea to be connected with the spread of the French revolutionary doctrine that men had rights as well as duties. At the end of the Napoleonic Wars in 1815, only six or seven of the present-day states of Europe, namely, the United Kingdom, France, Spain, Portugal, Denmark, Switzerland, and possibly "Russia," had approximately their present limits, the remaining

twenty-two of the twenty-six existing to-day being either very different in size and shape, or non-existent. Belgium and Holland in 1839 were the first of the new states to achieve their present outlines, Italy became united in 1861, the German Empire in 1871, Greece, Serbia, and Romania achieved their independence from the Turks during the nineteenth century, Sweden and Norway separated in 1905, and the remaining changes have mainly taken place since 1918.

It should be noticed that in nearly every case each state now possesses a language of its own, not spoken in Europe by any other large group, and though there are many dialects of each language, yet the inhabitants of each state are usually mutually intelligible. This tendency towards "one state, one language" is a growing one, even where for centuries the educated classes have spoken one of the more widespread languages of Europe; for instance, the written language of Norway was for centuries the same as Danish, and the educated people of Finland all spoke Swedish, but in each case a peasant speech is being standardised and is acquiring the dignity of a written language. Further, Belgium would probably now be part of France had it not been for the traditional policy of England against a strong power holding the Low Countries, and even Switzerland has found forces of disruption in her differences of language, though in regard to the commercial position of the country as a transit land they are very useful.

Many countries, however, possess minority dialects and even languages. For instance, Celtic languages are widely spoken in Brittany, Wales, and northern Scotland, while even in the little Netherlands the Frisian dialect is sufficiently unlike Dutch to be understood only with difficulty in the rest of the country. Provençal, spoken in southern France, and Catalan, spoken round Barcelona, resemble Latin rather than official French and Spanish. These small linguistic groups are of importance because language has become the main criterion of nationality, and moribund languages, *e.g.* Erse, are often revived artificially from political motives.

It does not follow that language affinities indicate racial affinities, though this belief is often widely held. People can adopt and abandon languages with surprising ease. It is interesting to contemplate the origin of modern French. Though it derives ultimately from Latin through the medium of the Roman legions, it was transformed first by a Celtic-speaking people who adopted the language of the conquerors, and later by the Franks, an invading Germanic-speaking people who adopted the language of the conquered. Perhaps the contemplation of the linguistic map of Europe prompted T. G. Masaryk's observation that there were

only twenty-eight states in Europe but sixty-two nationalities, though it is difficult to know at what point a dialect acquires the dignity of a language and becomes a weapon of separation.

Whether the growth of nationalism was a good or bad thing for Europe need not be discussed here. The existence of these nation states is a *fait accompli* which history presents to geography as one of the distributional facts of Europe. Possibly, however, the origin of the various nations may be considered a geographical study, at least in part, for the nations are indubitably associated with certain pieces of territory. With few exceptions, each nation took its origin in an area of fertility capable of supporting large numbers of people in easy communication with each other, and each fertile area was separated from other such areas by belts of mountainous or otherwise barren country incapable of supporting more than a scanty, disunited population. Thus the nucleus of the English nation was in the south-eastern lowlands, that of France in the large and fertile Paris basin, that of the Netherlands in the fertile dyked lands of Holland, and so on. This aspect of nationality is as complex as any other, and in some instances modern nationalities have emerged on the basis of a tradition nearly two thousand years old, as, for instance, those of Italy, Greece, and Romania.

It is, however, the concern of the geographer to note the facts of the distribution of the various states, but these can be seen by consulting suitable maps and need not be detailed here. The effects of the extreme subdivision of Europe on its economic organisation, or lack of it, are very complex and are to be seen in all aspects of the human geography of the continent. For instance, the geographer has not only to consider the capabilities of each part of the continent as regards productivity, but the many artificial influences at work in modifying the type of production, by artificial encouragement or restriction, and in altering the natural currents of exchange. The contrast between, *e.g.* the development of Austria and Switzerland, also illustrates the differences impressed on groups by their national organisation, since these countries are similar physically but until recently differed profoundly in national outlook and in their economic life.

Were Europe to become a single administrative unit, similar to the United States of America, for example, to which it is comparable in size, and which contains population elements from almost every part of Europe, one could imagine its economic geography showing very considerable divergencies from the present. The United States, however, had the advantage of starting with all the experience of Europe, and especially of the most advanced part of Europe, behind

it, with settlers of one dominating speech and tradition. Into this nucleus the later newcomers of varied nationality merged gradually and scattered throughout the length and breadth of the country, seldom forming solid blocks. Moreover, the United States developed at a time when improvements in methods of communication made large administrative units easy to manage. Europe, on the other hand, had to learn from its own experience, starting with the disadvantage of a multitude of small groups with different customs and varied languages, and each attempt towards unity was interrupted by the incursions of fresh invaders, and frustrated and hindered throughout by the difficulties of communication before the era of railways and telegraphs. The frequent presence of mountains, forest, and swamp enhanced the difficulties of communication and helped to isolate groups, so that communities living only twenty-five miles apart could develop almost unknown to each other, and a multiplicity of languages arose and persisted. It is not surprising that Europe has inherited a legacy of separatism and antagonism between its political groups, though this must needs be a hindrance in view of the increasing economic interdependence of the various parts of the continent and of the world.

REFERENCES

Among the vast amount of literature available, *We Europeans*, by J. S. Huxley and A. C. Haddon (London, 1935), is perhaps the most useful small book. G. M. Morant's *The Races of Central Europe* (London, 1939) is authoritative and makes special reference to blood-groups. *The Races of Europe*, by C. S. Coon (New York, 1939), is the modern monumental successor to the classic *Races of Europe*, by W. L. Ripley (London, 1899). *The Peoples of Europe*, by H. J. Fleure (Oxford, 1922), is a small but useful work.

On the linguistic side, *The Nationalities of Europe*, by H. Munro Chadwick (Cambridge, 1945), may profitably be consulted.

The New World: Problems in Political Geography, by I. Bowman (New York, 4th ed., 1928), deals mainly with Europe, and has excellent maps. *Traité comparatif des nationalités*, Vol. I: *Les éléments extérieurs de la nationalité*, by A. van Gennep (Paris, 1922), and *The Frontiers of Language and Nationality in Europe*, by L. Dominian (New York, 1917), may be usefully consulted. N. J. G. Pounds' *An Historical and Political Geography of Europe* (London 1947) is a useful résumé.

See also *A Geography of Europe*, by G. F. Hoffmann (London, 1954).

PART II
REGIONAL GEOGRAPHY
SECTION I—SOUTHERN EUROPE

CHAPTER V

GENERAL INTRODUCTION TO SOUTHERN
EUROPE

SOUTHERN Europe consists essentially of the lands bordering the northern side of the Mediterranean Sea, except Asia Minor. They form only a part of the great natural region which embraces *all* the lands bordering the Mediterranean Sea (except Egypt, which comes within the Sahara Desert zone), and the division into Europe, Asia, and Africa in this Mediterranean region is a convention of little geographical significance. These lands, lying between about 31° N. and 46° N., have a remarkable similarity of structure, relief, climate, vegetation, modes of agriculture, and, in spite of differences in language and religion between the European and non-European portions of the region, the general culture, or mode of life, is very similar. This similarity in culture was most marked under the Roman Empire, and in spite of repeated incursions of new peoples, it has constantly reasserted itself, owing largely to the strong similarity of natural conditions which prevails in all the Mediterranean lands. These natural conditions are markedly individual, and are peculiar to only a very few other parts of the globe, *e.g.* California and the Cape of Good Hope, but nowhere else are they so well represented as in the area under discussion.

The most marked individuality is to be seen in the climate, which combines the rainy winters of the cyclone belt with the arid summers of the Sahara Desert belt. (*See* Chapter II.) The climate is consequently sharply differentiated from that of the other climatic regions of Europe, which are alike in having rain in summer, and it follows that the native Mediterranean vegetation is also markedly different, having special adaptations to withstand the summer drought. (*See* Chapter III.) The Mediterranean climate and vegetation are, however, confined to the lands narrowly bordering

the sea, and are modified or disappear altogether away from the coastal zone. For instance, the interior of the Balkan or South-Eastern peninsula has a Central European climate with rain all the year and a Central European vegetation association, so also has the plain of the Po in northern Italy. The interior of the Iberian peninsula, on the other hand, has dry summers, but these are combined with cold winters having little rain, so that here there is an approach to desert conditions.

The third characteristic feature of the Mediterranean lands is their mountainous character. The Mediterranean Sea is almost entirely ringed round by young folded mountains, and its islands for the most part consist of isolated fragments of these chains. This gives the agriculture of the region one of its distinctive aspects, since it must be largely practised on hill slopes. These are little suited to the plough, and often need terracing to prevent loose soil from being washed away by the rain, which though infrequent is often torrential in character. Agriculture under these conditions is more concerned, therefore, with tree products than with cereals, though the interpenetration of plain, hill slopes, and mountain, together with nearness to the sea, gives the Mediterranean environment a fourfold aspect.

Unfortunately the plains were useless for many centuries owing to the scourge of malaria which flourished in these marshy regions. Badly-drained areas are, of course, to be expected on the margins of a tideless sea where the rivers form deltas, but a number of plains which were drained and cultivated in classical times became strangers to the plough in later centuries owing to the breakdown of organised life. This involved such diverse results as the neglect of drainage works, and the development of piracy owing to the lack of a strong navy, so that the plains became unsafe for agriculturists. The deforestation of much of the mountainous areas also combined with the torrential character of the rain to increase river-floods and to spread detritus over the little plains, and thus to increase their marshy character.

Incidentally, the heavy erosion of this mountainous region helps to give the Mediterranean landscape its characteristically sharp outlines, in contrast to the softer forms of most of the rest of Europe. The clearness of the air accentuates this sharpness, as there is rarely the veil of mist or "depth" of atmosphere to be found in the moister lands of north-western or central Europe. The mountains, however, in spite of much deforestation, supply irrigation water to the little plains.

In consequence of the mountainous nature of the land and the absence of navigable rivers, the sea frontage has always assumed

great importance, although the Mediterranean is not very rich in fish. The sea provided a relatively easy highway between regions whose land communications were difficult, and encouraged the early development of maritime life. Early navigation was chiefly a matter of sailing from headland to headland in the manner of Ulysses, and the absence of tides was, no doubt, a help to early mariners. These, however, did not put to sea during the period of winter storms, but confined their sailing to the summer season, when relatively calm seas were associated with steady winds.

The importance of the Mediterranean Sea was at its height in the days of the Roman Empire, which consisted essentially of a ring of land surrounding the mid-land sea. Its present-day traffic is, no doubt, larger than in classical times, but the relative importance of the sea is less, owing to the opening up of the rest of the world. The Mediterranean Sea at the present day is primarily a link in the shipping route between western Europe and the Orient, which was opened up by the cutting of the Suez Canal in 1869.

In classical times there was a marked community of culture round the whole basin, but the coming of the Moslem Arabs and Turks, from the seventh century onwards, created differences between the European and Asia-African sides of the basin. With the French and Italian penetration of the southern side in the nineteenth and twentieth centuries, these differences are diminishing, and, in fact, the essential modes of life have always continued very much the same.

Early Civilisation. On the debt which civilisation owes to the Mediterranean region it is not here necessary to enlarge. The spread of civilisation from the south-eastern corner of the Mediterranean to Greece, thence to Italy, and thence to the non-Mediterranean world, is well known. The geographical conditions in which early civilisation grew up in Egypt, the Near East, and the Mediterranean can be described fairly accurately, but it is difficult to say precisely what combination of circumstances caused the extraordinary quickening of spirit which produced the great early civilisations, and though there has been much conjecture, it cannot be maintained that the question is at all fully elucidated. From the geographical point of view it is clear that the environment was such as to stimulate early man without overstraining his powers, since the region was not so warm as to be enervating, nor so cold as to leave no time except for obtaining the bare necessities of life. The forest was in open formation and easier for early man to deal with than the dense, wet forests of north-western, central, and north-eastern Europe, and could be easily, in fact too easily, subdued by man's early weapon of fire. The fourfold nature of the environment

allowed the provision of all the necessities of life in a small area and also gave valuable experience in dealing with different problems of adaptation. The peculiar flowering of city life in the early Mediterranean is not, however, very easy to explain, although the large number of naturally defensive sites is, no doubt, part of the explanation.

It is worth mentioning here that this concentration into cities has continued down to the present day, some 40 per cent. of the population living in towns.

At the present day the Mediterranean region has lost its former prominence in the van of civilisation as well as much of its political and economic importance. The reasons for these changes are partly historical, and it is a truism that centres of world power have tended to move northwards into regions of more severe climate, but the present lack of economic strength may be ascribed chiefly to the absence of any large supplies of coal, oil, and iron ore, and also to the very restricted nature of the fertile plains. However, there are a number of signs that the region may have more economic prosperity in the future than it possessed during the "Age of Steam," for it possesses very considerable hydro-electrical resources, and various minerals, such as bauxite, which will be of increasing importance. The development of air-routes may also be useful in a mountainous area where the construction of roads and railways is extremely expensive.

In the following chapters the greater part of Italy and the whole of the Iberian peninsula will be dealt with, even though their northern parts lie outside the region of Mediterranean climate and natural vegetation. It is useful to include the whole of these countries in the section on southern Europe, since they have come so markedly under Mediterranean political and social organisation. The South-Eastern peninsula, however, apart from the Greek peninsula and islands, will not be included, as the major portion is definitely non-Mediterranean in almost every aspect.

REFERENCES

Southern Europe, by M. I. Newbigin (London, 2nd ed., revised by Church, 1948), is the standard work in English. The same author's *Mediterranean Lands* (London, 1924) deals mainly with the historical geography of the region.

E. C. Semple's *The Geography of the Mediterranean Region* (New York, 1931) embodies historico-geographical researches.

A. Philippson's *Das Mittelmeergebiet* (Leipzig, 1904, 4th ed., 1922) is a standard German work. For references on structure, see end of Chapter I. *Peninsular Europe*, by L. W. Lyde (London, 1931), contains interesting chapters on the Mediterranean lands.

An Historical Geography of Europe, by Gordon East (London, 4th ed., 1950), describes the human geography of Europe at successive periods from the time of the Roman Empire onwards, and may be profitably consulted for western and central Europe also. The same author's *Mediterranean Problems* (London, 2nd ed., 1943) is recommended for the political and strategical aspects.

CHAPTER VI

ITALY

THE Italian peninsula may be looked upon as the most Mediterranean in character of all the three southern peninsulas. Mediterranean influences permeate the region more fully than in the South-Eastern peninsula or even in the Iberian peninsula, largely owing to its long and narrow shape. In climate, especially, it is more Mediterranean than the other two peninsulas. In the South-Eastern peninsula only on the Dinaric coast does the Mediterranean climate extend as far north as in Italy, and the reason for this northward extension is essentially the same in both cases, *i.e.* the coastal character. Peninsular Italy is so long and narrow and so open to sea winds that it may be looked upon as climatically *all* coastal. It is too narrow to develop a marked pressure system of its own, but comes under the influence of pressure variations over the Tyrrhenian and Adriatic Seas, so that, whereas Niš in the interior of the South-Eastern peninsula has a continental climate, Florence in the same latitude in the interior of peninsular Italy has a Mediterranean one.

Although the Mediterranean type of climate extends as far north as Genoa ($44\frac{1}{2}^{\circ}$ N.), yet nearly a third of Italy lies outside the region of Mediterranean climate, both the North Italian Plain and the Italian Alps falling within the climatic region of central Europe, with cold winters and the absence of a dry season. Northern Italy, however, is not so remote from other types of Mediterranean influence as the interior of the South-Eastern and Iberian peninsulas, since the plain of the Po opens widely to the Adriatic, and there is also a relatively easy outlet to the Mediterranean over the narrow Ligurian Alps. The names of Venice and Genoa call to mind the long history of the Mediterranean trading routes and their landward continuations over the North Italian Plain and the Alps. Moreover, Mediterranean culture and the Latin language spread over the great plain of northern Italy in classical times more thoroughly than the Greek language and culture were ever able to spread over the difficult mountainous interior of the South-Eastern peninsula, and, what is more important, Mediterranean culture and a language based on Latin have managed to retain their hold in spite of repeated invasions from across the Alps.

Relief and Structure. Italy falls into three main structural regions (see Fig. 13): (a) the folded Alpine zone which is dealt with in the section on the Alps (see Chapter XXIII), (b) the North Italian Plain or Plain of the Po, an area of young undisturbed sediments, (c) the folded Apennine zone, which comprises almost the whole of the Italian peninsula, Sicily, and the adjacent islands. The exact tectonic affinities of Sardinia are not very clear, but the island may be treated as part of a "median mass" (see p. 9), together with the similar island of Corsica, which is politically French. Minor structural elements are to be found, particularly in the extreme north-east, which falls within the Dinaric system, and in the south-east, where Apulia forms a platform of little disturbed rock.

Although the Apennines are a comparatively simple mountain system, yet they have had a fairly long and complicated geological history. At least two main periods of folding are distinguishable. The first occurred in early Tertiary times (late Eocene and early Oligocene) and involved principally the Mesozoic limestones of "Tethys." This was followed not only by pronounced denudation, but also by a retrogressive movement which caused the mass to sink below the sea in mid-Tertiary times (early and middle Miocene), during which period sands, marls, and clays were deposited. A second period of folding in late Miocene times, which involved these sands, marls and clays, often known as *Flysch*, was followed by a second sinking, and at the end of the Tertiary period the northern and central Apennines were deeply penetrated by arms of the sea, while the southern Apennines were represented by an archipelago of small islands only. The subsequent re-elevation, which took place at the end of the Tertiary period, was epeirogenic in character. (See Chapter I.) There was a general upward movement *en masse* which brought to light the clays, sands, marls, and conglomerates which had been deposited in the shallow seas and straits between and around the main folds. In places these Pliocene sands and gravels are found at remarkable heights, *e.g.* at 3,900 feet in Aspromonte (Calabria), but in general they were not folded but merely warped. Much faulting accompanied this upheaval, however, and this was associated with severe vulcanism, especially on the side bordering the Tyrrhenian Sea, which is about three times as deep as the Adriatic (*c.* 9,000 feet, as against *c.* 3,000 feet maximum depth), and where consequently earth stresses are particularly great. Vesuvius, the only active volcano of the European mainland, lies on the Tyrrhenian side, and there are large tracts of land on either side of the river Tiber which are built up of volcanic material. The Lipari Islands, in the south-east of the Tyrrhenian Sea, include the small island of Vulcano which gave its name as a generic title

for this type of mountain. Mt. Etna and Monte Vulture are the only evidence of recent vulcanism lying on the eastern side of the Apennine folds. The numerous earthquakes of southern Italy demonstrate, however, that earth movements are not yet at an end in the Apennine system.

The backbone of the peninsula contains the severely folded rocks

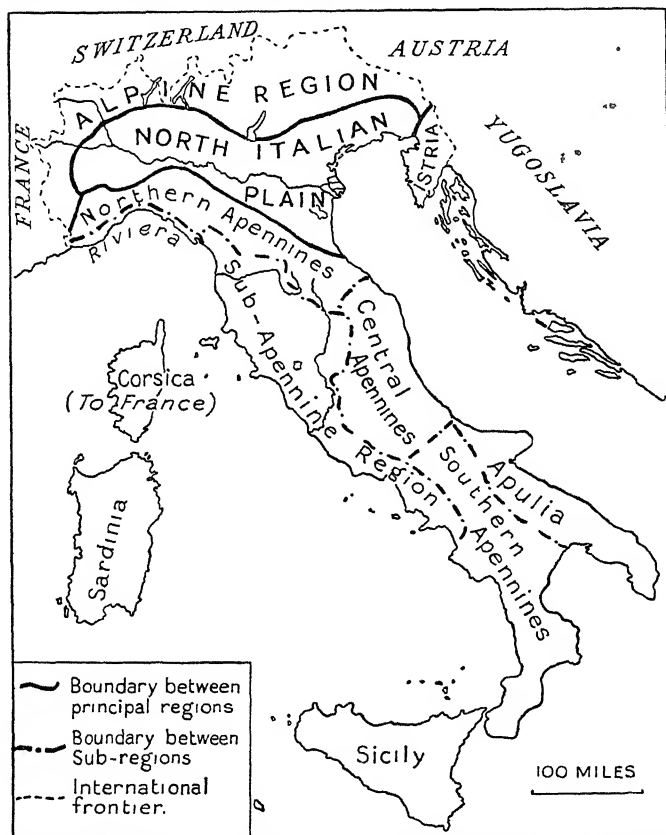


FIG. 13.—ITALY, SHOWING THE MORE IMPORTANT NATURAL REGIONS.

of the early and mid Tertiary foldings, and these stand out as the main ridges of the peninsula, largely owing to the presence of much resistant limestone. In the northern Apennines, however, the main chains are largely composed of Flysch and similar rocks, which weather more easily than the limestones and form lower and more dissected chains. Few parts of the Apennines show a really Alpine or high-mountain character, though the preponderance of

limestones, combined with severe erosion, helps to give a wild appearance. There was relatively little Quaternary glaciation, the best example of the resultant Alpine forms being in the mass of the Gran Sasso d'Italia (9,560 feet). Geologists have recently recognised *nappes* in the Apennines, but they have little geographical significance.

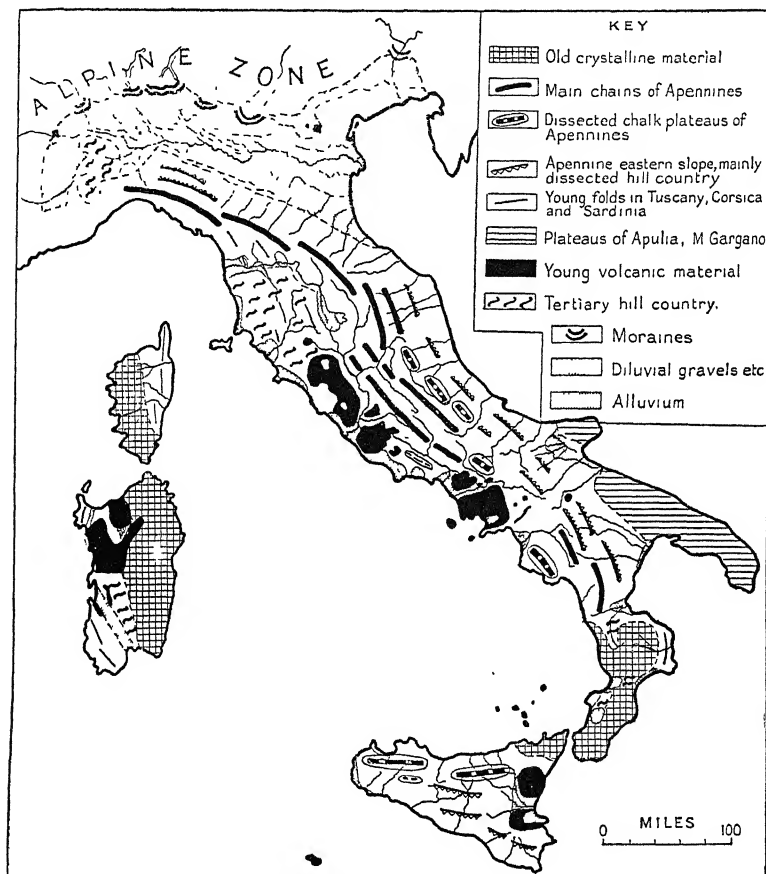


FIG 14.—STRUCTURAL DIAGRAM OF ITALY.

After O. Maull

The main Apennine chains swing in a wide curve from the Gulf of Genoa across the peninsula towards the Adriatic, enclosing between themselves and the Tyrrhenian Sea the hilly area known as the Sub-Apennine region, which includes within it the volcanic zone of Latium and Campania. In Tuscany, the region consists

mainly of lightly folded Tertiary sandstones, but incorporates fragments of older rocks (mainly Permian) in the Catena Metallifera Toscana. On the Adriatic, or outer side, of the Apennines, the land falls to the sea-coast by means of an "eastern slope," consisting of Tertiary sands and clays which are much dissected into foothills. Then the main chains cross over once again to the western side, leaving on the east in Apulia a limestone platform, which was not involved in the Apennine folding, but was raised *en masse* with the second, or later Tertiary, upward movement. On the south the chains run up against the crystalline masses which fill up almost the whole of Calabria. A similar, but smaller, crystalline mass forms the north-east corner of Sicily, but disappears westwards under the Apennine folds which border the northern coast of that island. In Sicily, young volcanic deposits are found exceptionally on the outer, here the southern, side of the arc. The rest of southern Sicily is taken up by young Tertiary material similar to that on the eastern slope of the eastern Apennines in peninsular Italy.

The Apennine chains are fairly easily penetrated by means of depressions, which were formerly occupied by arms of the sea or by lakes. Fig. 22 shows the main features of the present complex river system in the central and Sub-Apennines, with its remarkable series of longitudinal valleys. The Pliocene lake-basins have been considerably dissected, but nearly all the longitudinal valleys were occupied by lakes in geologically recent times, mainly because the Sub-Apennine region rose rather more quickly than the main chains and blocked the westward drainage of the Apennine streams, and also because volcanic material sometimes dammed up the passage of the river water. These longitudinal valleys afford easy communication among high and rugged mountain country, which would otherwise be difficult to penetrate. In contrast, the outer or eastern slope of the Apennines is drained by a great number of short, consequent streams, running parallel to each other, which provide considerable obstacles to movement.

Sardinia and Corsica (French) consist mainly of old crystalline masses, but Corsica contains young folds in the north-east, and Sardinia has similar folds in the south-western corner. The latter island also contains a region of young, volcanic material in the north-west. A tiny fragment of ancient crystalline material is found in Elba. It is not now considered that these scattered fragments of ancient crystalline rock affected the direction of the Apennine folds. It is thought more likely that they are part of a "median mass" which has foundered elsewhere, though they are considered by some authorities to be similar to the interior crystalline blocks of the western Alps, e.g. the Mont Blanc massif.

North of the Apennines lies the geosyncline of the North Italian Plain. It is evident that in late Tertiary times the shallow Adriatic Sea extended far west of its present limits, but a slight elevation, coupled with tremendous deposits of waste material from the bordering mountains, brought the present plain into being. Most of the material composing the plain is derived from the Alps rather than the Apennines owing to the greater height of the former range, and, in consequence, there is generally a slight slope southwards as well as eastwards, so that the River Po flows nearer the southern than the northern border for the greater part of its course through the plain. Even this tranquil zone of plain shows some evidences of disturbances in two tiny groups of Tertiary volcanic hills, the Monti Berici and Monti Euganei.

Climate. In climate the Northern Plain and the Alpine region are clearly marked off from the peninsula and islands. In the northern plain the winters are as cold as those of London, and often raw and foggy, though the influence of the Adriatic gives Venice and the coastal zone rather higher winter temperatures. On the other hand, summers are sufficiently long for both rice and maize.

| | Altitude in feet | Latitude | Mean Monthly Temp. in degrees F. | | Annual Rainfall in inches |
|-------------|---------------------|----------|-------------------------------------|------|---------------------------------|
| | | | Jan. | July | |
| Venice . . | sea-level | 45° 26' | 37 | 75.5 | 29.3 |
| Milan . . | 482 | 45° 28' | 32 | 75 | 39.7 |
| Alessandria | 322 | 44° 54' | 31 | 74.5 | 25.5 |

The rainfall is well distributed throughout the year, as the following figures show.

| | Jan | Feb. | Mar | Apr. | May | June | July | Aug. | Sept. | Oct. | Nov. | Dec. | Year |
|-----------------|-----|------|-----|------|-----|------|------|------|-------|------|------|------|------|
| Venice (inches) | 1.6 | 1.6 | 2.0 | 2.4 | 2.9 | 3.0 | 2.3 | 2.5 | 2.8 | 3.6 | 2.7 | 1.9 | 29.3 |
| Milan (inches) | 2.4 | 2.3 | 2.7 | 3.4 | 4.1 | 3.3 | 2.8 | 3.2 | 3.5 | 4.7 | 4.3 | 3.0 | 39.7 |

In the Alpine region, temperatures naturally vary according to altitude and aspect. The foothill zone and the deep southward-opening valleys of the southern border of the Alps between Lake Maggiore and Verona, and even farther east, have milder winters than the northern plain, owing to the shelter given by the Alps.

MEAN MONTHLY TEMPERATURE IN DEGREES FAHRENHEIT

| | Jan | July | | Jan. | July |
|---------------------------|-----|------|-------------|------|------|
| Bergamo . | 36 | 73 | Bassano . . | 37 | 77 |
| Desenzano (Lake Garda) | 37 | 74.5 | Conegliano | 38.5 | 73.5 |

The rainfall, however, in this sheltered zone is heavy, as in the Alps, and there is no dry season.

MEAN MONTHLY RAINFALL IN INCHES

| | Jan. | Feb | Mar | Apr | May | June | July | Aug. | Sept. | Oct. | Nov | Dec | Year |
|-------------------------|------|-----|-----|-----|-----|------|------|------|-------|------|-----|-----|------|
| Como . . | 2.9 | 3.8 | 4.6 | 6.5 | 7.9 | 6.0 | 5.2 | 5.0 | 6.3 | 7.6 | 6.1 | 3.7 | 65.6 |
| Lugano (Switzerland) | 2.6 | 2.2 | 4.0 | 6.3 | 7.0 | 7.3 | 6.3 | 7.2 | 7.6 | 8.2 | 5.4 | 2.8 | 66.9 |

In peninsular Italy there is a considerable contrast between the northern portion, north of about the latitude of Naples, and the southern portion, including Sicily. In the former the winter temperatures are rather low even on the coasts, especially on the east coast.

MEAN MONTHLY TEMPERATURE IN DEGREES FAHRENHEIT

| | Latitude | Jan. | July | | Latitude | Jan. | July |
|---------|----------|------|------|--------|----------|------|------|
| Leghorn | 43° 32' | 45 | 76 | Ancona | 43° 37' | 42 | 78 |
| Viterbo | 42° 25' | 41.5 | 73 | Chieti | 42° 21' | 39 | 73 |

At any considerable altitude, temperatures are naturally much lower, and as the greater part of peninsular Italy is at considerable altitudes, the region is not so warm as is often supposed. Winters in the mountains of central Italy are as cold as in the Northern Plain.

| | Jan. | July | Latitude | Altitude in feet |
|-----------------------|------------|--------------|----------|---------------------|
| Vallombrosa | ° F. 34 | ° F. 63.5 | 43° 44' | 3,132 |
| Camaldoli | 32 | 64 | 43° 48' | 3,647 |

The precipitation here is definitely seasonal with a maximum in autumn, and often takes the form of snow. There is a marked dry season in summer, which, however, is not so severe nor so long as in southern Italy.

MEAN MONTHLY RAINFALL IN INCHES

| | Jan | Feb | Mar | Apr | May | June | July | Aug | Sept. | Oct | Nov. | Dec. | Year |
|------------|-----|-----|-----|-----|-----|------|------|-----|-------|-----|------|------|------|
| Florence . | 2.7 | 2.5 | 3.0 | 3.1 | 3.0 | 2.1 | 1.4 | 2.0 | 3.3 | 4.3 | 4.3 | 3.3 | 35.0 |
| Rome . . | 3.2 | 2.7 | 2.9 | 2.6 | 2.2 | 1.6 | 0.7 | 1.0 | 2.5 | 5.0 | 4.4 | 3.9 | 32.7 |

The Riviera coast forms a definite sub-region with considerably higher winter temperatures.

MEAN MONTHLY TEMPERATURE IN DEGREES FAHRENHEIT

| Genoa | Jan. | Feb. | Mar. | Apr. | May | June | July | Aug | Sept | Oct. | Nov. | Dec. | Year |
|---------------|------|------|------|------|-----|------|------|-----|------|------|------|------|------|
| Temperature . | 46° | 48° | 52° | 58° | 63° | 70° | 75° | 75° | 71° | 62° | 53° | 47° | 60° |
| Rainfall . . | 4.2 | 4.3 | 4.1 | 4.1 | 3.4 | 2.7 | 1.6 | 2.4 | 5.0 | 7.8 | 7.4 | 4.8 | 51.8 |

Southern Italy, including Sicily, is distinguished by the long period of summer drought, small number of rain-days, and high winter temperatures, especially in Sicily.

| | Latitude | Jan. | July | | Latitude | Jan. | July |
|--------|----------|------|------|-----------|----------|------|------|
| | | ° F. | ° F. | | | ° F. | ° F. |
| Naples | 40° 52' | 46.6 | 75.2 | Messina . | 38° 11' | 53 | 78.5 |
| Bari . | 41° 16' | 46.5 | 75.5 | Trapani . | 38° 1' | 54.5 | 77 |

Higher stations naturally show lower temperatures:

| | Jan. | July | Latitude | Altitude in feet |
|-------------------------|------|------|----------|------------------|
| | ° F. | ° F. | | |
| Potenza | 37 | 69 | 40° 48' | 2,711 |
| Caltanissetta | 43.5 | 76 | 37° 30' | 1,871 |

In the extreme south there are usually three months in summer with less than one inch of rain.

MEAN MONTHLY RAINFALL IN INCHES

| | Jan | Feb. | Mar. | Apr. | May | June | July | Aug. | Sept. | Oct. | Nov | Dec | Year |
|---------------|-----|------|------|------|-----|------|------|------|-------|------|-----|-----|------|
| Caltanissetta | 4.1 | 2.9 | 2.2 | 1.8 | 1.5 | 0.4 | 0.2 | 0.5 | 1.2 | 2.5 | 2.8 | 3.9 | 24.1 |

One of the striking facts that emerges from a study of Italian climatic statistics is the similarity of the summer temperatures, for almost the whole of Italy, apart from high mountains, has a mean July temperature of about 70° to 75° F.

A—CONTINENTAL ITALY

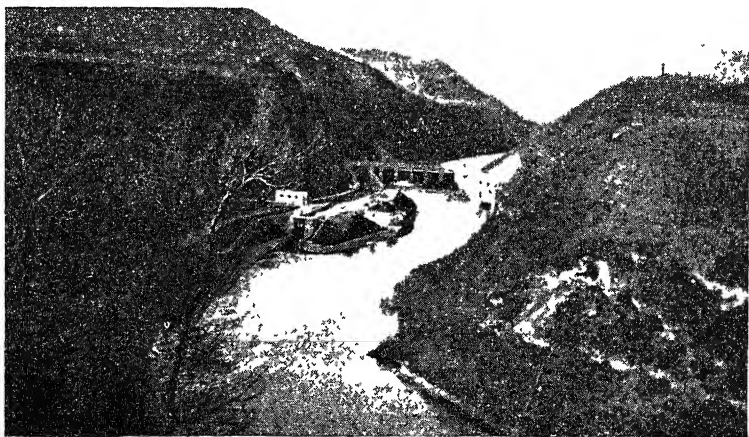
The Transition Zone between the Northern Plain and the Alps. A number of morainic amphitheatres lie at the exits of the great Alpine valleys. Behind these terminal moraines lie depressions often filled by the great Italian lakes, and elsewhere presenting a ground moraine landscape. The rivers have cut through the morainic walls in rather deep valleys with a considerable gradient; consequently water power can be developed here, *e.g.* at Paderno d'Adda (*see* Fig. 15). These morainic hills do not merge into each other as on the northern side of the Alps, and between them the rock material varies from bastions of solid rock to coarse detritus of many kinds brought down by mountain torrents. On the Apennine side there are no morainic hills and the transition between the plain and the mountain takes place rather more quickly.

This encircling zone of hill country is terraced for cultivation wherever the exposure is favourable and it is mainly a land of vines and orchards. A fair amount of timber is to be found on poor soils and in poor positions. Bare slopes and patches of neglected, sterile ground are also to be found, particularly on the Alpine side.

The Alpine valleys, especially between Lake Maggiore and Lake Garda, though properly belonging to the Alpine zone, may be treated here, since they prolong the lowland zone into the mountains, and have some of the features of the Mediterranean climate. The mountains give sufficient shelter against cold winter winds to allow the olive to grow, a tree which is almost entirely absent from the North Italian Plain owing to the winter cold. But the mean January temperatures, even in this sheltered zone, are rather low (*see* p. 54). The rainfall is heavy and the distribution is non-Mediterranean, there being no dry season or month, and the summer

six months (March-August) having a heavier rainfall than the winter. The months of maximum rainfall are usually May or June, with a pronounced secondary maximum in October. The climate may be called pseudo-Mediterranean. A number of tourist centres have grown up round the lakes.

The Plain. The plain itself is 250 miles long from the foothills of Piedmont (It., Piemonte) to the mouths of the Po, about 50 miles wide in Lombardy (It., Lombardia), and about 120 miles wide in the longitude of the Po delta (*see* Fig. 16). The plain of Venetia (It., Venezia Euganea) prolongs it in the north-east for another



[Photo I J. Curnow

FIG. 15.—THE RIVER ADDA AND HYDRO-ELECTRIC INSTALLATIONS.

This swift-flowing river, shown about thirteen miles south of Lecco where it leaves Lake Como, was one of the earliest to be used to generate electricity, a power plant having been built at Paderno in 1897 to supply Milan and Monza with power and light. The view shows the original dam, a small power-plant, and the take-off of a canal leading to the main power station.

eighty miles, with a width of about thirty miles, until the karstic hills of Istria are reached.

The plain is generally very flat except for the rounded Tertiary hills of Montferrat (It., Monferrato) in Piemonte, which could more properly be included in the Apennine system, and the little volcanic Monti Berici and Monti Euganei in the province of Venezia Euganea. It is also low-lying, and a rise of 300 feet in the level of the sea would restore almost the whole area to its former state as an extension of the Adriatic.

The plain may be divided into two main zones, namely, the unirrigated and the irrigated. From the Alps towards the river Po

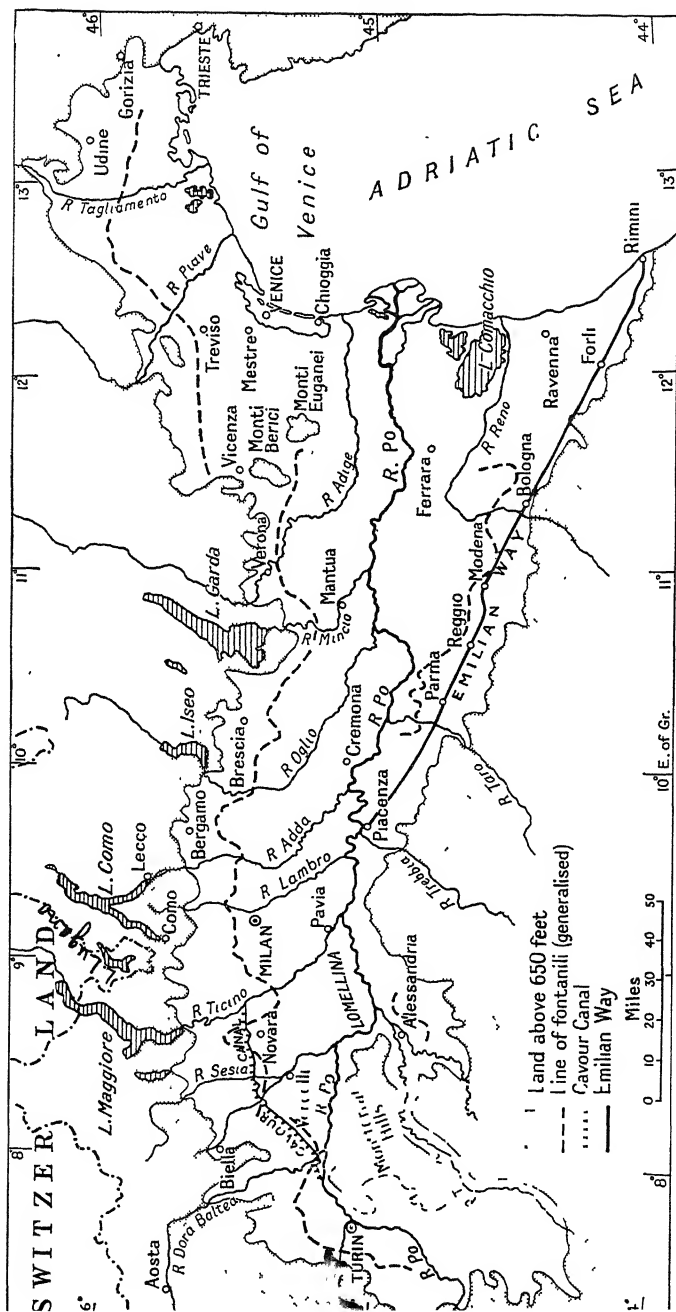


FIG. 16.—THE NORTH ITALIAN PLAIN.

NOTE: (a) the attenuation of the plain at its north-eastern and south-western extremities, (b) the lines of springs (*fontanili*), and (c) the sense of towns on the banks of the river Po below Piacenza.

the alluvial material of which the plain is composed becomes progressively finer, but usually so gradually that the conventional division into an outer zone of gravels and a central zone of fine silt is somewhat artificial, and a division based on capacity for irrigation is more valuable. There is, indeed, usually a marked contrast between the central part of the plain which is irrigated, and the zone to the north which is unable to obtain irrigation water, but the irrigation zone extends northwards in places into the zone of coarser material. It may seem strange at first sight that a plain which has a considerable rainfall, well distributed throughout the year, should need irrigation. Summer temperatures are high, however, usually over 70° F. for three months, and while it is true that some crops, such as mulberries, wheat, and hemp, usually grow perfectly well without irrigation, it is essential to such crops as rice, and it greatly increases the yield of others, particularly the forage crops.

The boundary between the arid and the irrigated zones corresponds roughly with a line of springs, which occur where the water-table cuts the north-to-south slope of the plain. In western Lombardia these springs occur in a band about six miles wide in the latitude just north of Milan. These springs, known as *fontanili*, increase in importance from east to west, and they play an important rôle in the irrigation of the plain, though the greater part of the water is derived from the rivers coming down from the Alps. In the north of the "dry" zone these rivers are incised too far below the level of the plain for their water to be diverted economically, but the southern part of the "dry" zone has generally been brought into the irrigation system, the most northerly canals, *e.g.* the Canale Villoresi in Lombardia, running north of the *fontanili*. A similar line of springs occurs on the Apennine side of the plain.

The Dry Zone bordering the Alpine Foothills. This forms a narrow band all the way from Piemonte to eastern Venezia Euganea, inclusive. It is usually composed of permeable, rather infertile gravels, but also contains some impermeable material, *e.g.* in parts of Piemonte. Originally forested like the rest of the North Italian Plain, it was long ago cleared, and there are considerable areas of heathland in the most arid parts, though some re-afforestation is in progress. For the most part the area is cultivated, and mixed farming is the rule, with wheat, maize, rye as the typical cereals, some meadowland, vineyards, and mulberry trees, though in a few localities one type of farming predominates over another, as, for instance, the great concentration on mulberries in the district round Monza, in Lombardia. The population density is generally below the average for the plain, except where manufactures have arisen.

The Irrigated Zone borders the arid zone on the south. Some of the canals date from the Middle Ages; for instance, the precursor of the Naviglio Grande, between the Ticino and Adda, was cut in the twelfth century, but the largest canals were constructed in modern times. The Cavour Canal, running between the upper Po, the Dora Baltea, and the Ticino, built in the middle of the nineteenth century, is fifty-three miles long, and transformed an almost barren region of 380,000 acres of sand and gravel into the most fertile rice-fields and meadow-land of Italy, where the best Parmesan and Gorgonzola cheeses are produced.

The North Italian Plain presents the largest area under irrigation in Europe and the greater part of Italy's $4\frac{1}{2}$ million acres of irrigated land are to be found there, but as in all such irrigation areas, the

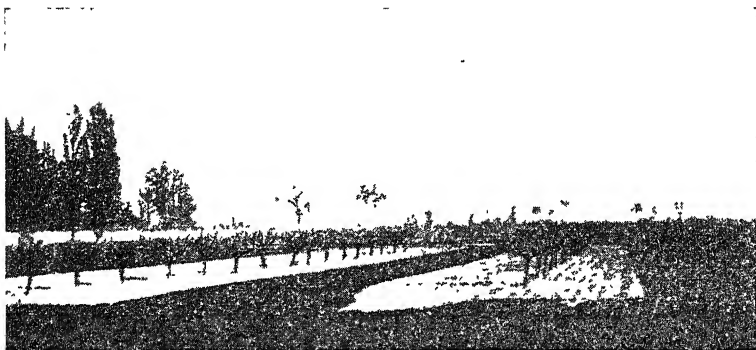


FIG. 17.—VIEW IN THE PLAIN OF LOMBARDY, SOUTH OF PAVIA.

The trees planted in rows are mulberries. The light-coloured patches are irrigated strips growing rice. The line of the Apennines is visible in the distance.

imposing network of canals which appears on the map resolves itself on the spot to inconspicuous ditches bordering a field. In spite of its extreme flatness, the plain does not present a monotonous aspect. Although there are usually no hedges, each field is bordered and traversed by lines of trees of various kinds, such as elms and fruit trees, with an occasional Lombardy poplar, so that the cultivated foreground seems to dissolve into a pleasant woodland. The small fields are occupied by strips of crops of different form and colour, such as rice, maize, flax, clover, wheat, lucerne, with patches of bare, brown soil, occasionally glinting with irrigation water, if the season be early enough. In the distance a village is usually to be seen, its harmonious groups of buildings half-hidden in its setting of trees. Occasionally the usual mixed cultivation gives place to monoculture, as in the irrigated rice-fields of Piemonte,

particularly in the Lomellina, bordering the river Po between its Sesia and Ticino tributaries, but this is rather exceptional. The vine is grown to some extent everywhere, but particularly between the Mincio and Oglio, and the latter river and the Po, *i.e.* the Mantua region (It., Mantova).

In connection with the forage and grain crops, there are important dairying and poultry industries. In this region of intensive agriculture the cattle are seldom seen in the fields, but are stall-fed, and the milk is either converted into butter, which is eaten in the large towns of the north, or into cheese, which is largely exported.

Most of the irrigated zone would revert to swamps and lakes were it not for the protective dykes which border the river Po, and the lower courses of its chief tributaries, from Pavia downwards. East of Ferrara, in a triangle roughly between the lower Adige, the Reno and the Adriatic Sea, many swamps and lagoons still remain, though modern mechanical pumping has been successful in reclaiming large areas. This region of new polders still presents a raw appearance. Its treeless surfaces, crossed by straight, apparently endless roads, are the domain of the vast estate, and are worked mainly with modern machinery, instead of the ox-drawn plough and spade used in the rest of the plain. The greater part of this newly reclaimed land lies in Emilia.

Emilia. This section of the plain may be treated separately since in some respects it differs from the plain north of the river Po. It is roughly triangular in shape, being bounded by the Po on the north, the Adriatic on the east and by the lower slopes of the Apennines on the remaining side. Its sediments are derived from the Apennine rivers, which are liable to severe floods in winter but carry less water than the Alpine streams in summer, so that irrigation water is more variable in amount here, except east of Ferrara, where water stagnates on the land. Water from *fontanili* is, however, available for irrigation, the line of *fontanili* running just north of the Emilian Way, along its middle section between Parma and Bologna. The Emilian Way roughly marks the boundary between the fine sediments of the flood plain and the older, coarser sediments to the south, but the latter is here very narrow.

Reclamation and irrigation on a large scale took place in Emilia during the 1920's and 1930's, the north-easterly lagoon-region being drained and the drier westerly region being provided with additional water supplies. It remains a less picturesque region than Lombardy or Piedmont, however, and is the domain of industrial crops, especially sugar-beet and hemp, which have partially ousted the older wheat cultivation of the drier lands. Rice cultivation is carried on in the wetter lands east of the river Reno.

Along the Emilian Way cultivation becomes much more mixed, with wheat, meadow grasses, vines, fruit trees, and vegetables.

Town Sites. In a level plain of this kind the distribution of settlements is apt to be somewhat sporadic. Five lines of towns may be distinguished, however, of which those situated along the edges of the Alps and Apennines are the most obvious.

(a) A number of towns have grown up where the Alpine valleys open on to the plain. Such are Turin (713,000,¹ *see infra*), Como (42,000), Bergamo (102,000), Brescia (147,000), and Verona (191,000). Many of these were strategic in origin, but the development of hydro-electricity has led them to develop as industrial towns.

(b) On the Apennine side, the towns lie along the old Roman Via Emilia, at points where routes across the Apennines debouch upon it. Such towns are Rimini (29,000), Forlì (33,000), Bologna (326,000), Modena (113,000), Reggio (106,000), Parma (123,000), Piacenza (50,000).

(c) The central line, which one might expect to find along the main river, is incomplete, owing to the danger from inundation, and there is no town actually on the Po below Piacenza, though Cremona (52,000) is very near the river. Turin, already mentioned in (a), is the chief town in this category, while Piacenza also comes into (b).

(d) A number of settlements stand in the region of junction between the dry and irrigated zones on the northern side of the plain. This represents the easiest line of east-west movement, because it lies between the formerly marshy land to the south, and the high-plains, whose surface is interrupted by numerous deeply incised river valleys. Of these towns Novara (52,000), Milan (1,273,000), Padua (164,000), and Treviso (39,000) are representative.

(e) The remaining group of towns lies along the coast, and includes Venice (303,000), Chioggia (24,000), Ravenna (29,000), and Rimini (*see (b) above*), though, owing to silting, Ravenna is now some six miles inland, while the old port of Adria is as much as fourteen miles inland.

Milan (It., Milano), the largest town of the plain and until very recently the largest in the whole of Italy, may be looked upon as the commercial and industrial capital of the country. There seems to be no particular geographical reason why this city stands *exactly* where it does, but it is well situated in regard to routes. Upon Milan focus two out of the five main railway lines across the Alps—namely, the St. Gothard and the Simplon. The Splügen, Maloja, and Bernina Passes also lie to the north of Milan and were much used

¹ Figures for towns of more than 1,000,000 inhabitants are based on the 1951 Census and those for towns of less than 100,000 on the 1936 Census: those for intermediate towns are 1947 estimates.

in the Middle Ages. The city is the great banking centre of Italy, and has textile, clothing, and engineering industries, including the manufacture of motor-cars, agricultural machinery, steam engines, etc. It possesses a semicircle of satellite towns on the north, such as Monza (59,000), Busto Arsizio (33,000), Sesto San Giovanni (32,000), Legnano (31,000), Gallarate, Varese, and others, which carry on varied industries—textile, metallurgical, engineering, chemical—and which look to Milan as their commercial and cultural centre.

The immediate advantages of the site of Turin (It. Torino; 713,000) are more obvious. It stands at the junction of the Po with the Dora Riparia, whose double-headed valley leads up to the Genève Pass in the south and the Mt. Cenis Pass in the north, the latter route being now used by a railway, though the actual Mt. Cenis Tunnel is under the Col de Fréjus. The Montferrat Hills (noted for their vineyards, which produce Asti) to some extent restrain routes from leaving the Po valley for some distance above and below the city. It carries on active commerce and manufactures, particularly of textiles and machinery, including motor-cars.

The North Italian Plain, particularly those parts of Lombardia, Piemonte, and Venezia Euganea bordering the Alps, is the most active manufacturing zone of Italy. This development is of very modern growth and has little connection with the mediæval handicrafts. It depends for its power on hydro-electricity, transmitted from the Alps, consequently the factories are very dispersed as there is a wide choice of site.

Textiles, particularly cotton, silk (both real and artificial), wool, and hemp, are of outstanding importance, and are manufactured in innumerable small towns at the foot of the Alps and in the high plains. The woollen industry has some roots in the past, and still tends to be located in small towns near the old sheep pastures of the high plains and foothills. It is especially important in and near Biella (24,000) in Piemonte, while the province of Como in Lombardia concentrates a large part of the real silk industry, which is supplied from locally reared silk-worms fed on the leaves of the white mulberry. The cotton and rayon industries are widespread throughout the sub-Alpine region, and since all the raw materials are imported, the location of the industry is a compromise between nearness to transport and to a convenient supply of hydro-electricity. Hemp, though manufactured to some extent in Emilia where it is grown, is chiefly spun and woven in the cotton and rayon towns. Metallurgy, engineering, and chemical industries similarly depend largely on the well-distributed supplies of hydro-electricity and the ease of communication in the North Italian Plain, and are widely

spread, with some concentration round Turin, the Val d'Aosta, Milan, Brescia, Bergamo, and Vicenza.

Most of the international traffic of the plain goes *via* the Alpine railway routes, but the main sea outlet is Genoa (It. Genova) and not Venice (It., Venezia). Like most ports at the seaward end of a growing plain of deposition, Venice is handicapped by shallow water and the constant deposition of silt (*cf.* Calcutta, Shanghai). The old mediæval town, built on piles driven into mud flats, is now, thanks to its architectural and historic riches,



FIG. 18.—GENOA: PART OF THE OLD TOWN AND HARBOUR.

This view was taken from the same hill as Fig. 19, and indicates how steeply the land rises from the sea.

mainly a tourist centre; the modern town and port of Mestre (24,000) has been built on the mainland.

Peninsula of Istria. This area belongs structurally to the Dinaric system. The base of the peninsula consists of a waterless limestone plateau known as the Karst (It., Carso), which gave its name to similar land-forms elsewhere. Parallel to this to westward lies a Flysch-filled depression, and westward again lies another limestone zone along the coast. North-east of the Carso another Flysch-filled depression rises to a high karst region which separates the Adriatic lowlands from the Danubian lowlands and forms a saddle between the high mountains of the Alpine chain and those of the Dinarics. The railway over the saddle from Austria *via* Ljubljana (Laibach) to Trieste and Fiume crosses it at a height of less than 2,000 feet; in other words, this is the lowest pass in the whole

Alpine-Dinaric system. To the north of this saddle lie the famous mercury mines of Idria.

On either side of the peninsula of Istria lies an important port, Trieste (262,000) on the west, and Fiume (53,000) on the east. Trieste has an artificial harbour but lies out of the way of the silt of the Isonzo and other rivers of Venetia, as the current sweeps from east to west. Fiume is closely hemmed in by mountains, but has less steep gradients inland than ports farther down the Dalmatian coast. Both Trieste and Fiume have the central Danubian lands

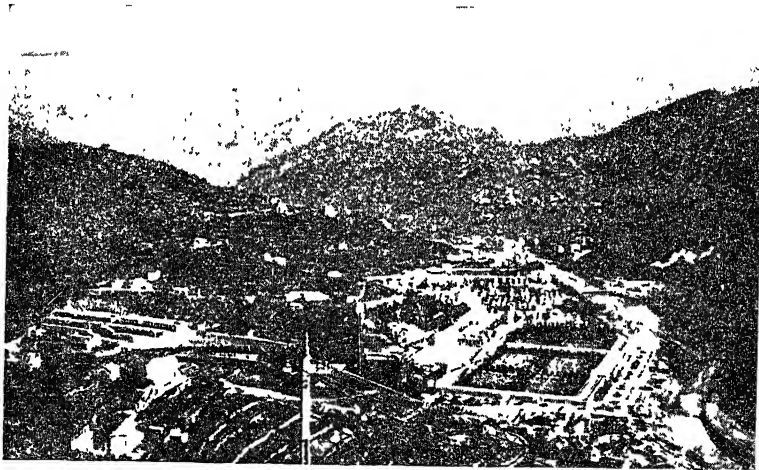


FIG. 19.—THE LIGURIAN MOUNTAINS BEHIND GENOA.

The rugged mountains behind Genoa are threaded by routes leading to the North Italian Plain. Note that this photograph was taken from the same hill as Fig. 18.

as their hinterland (*see* Fig. 127), and before 1918 Trieste was the port of Austria and Fiume that of Hungary, the railways connecting with the interior having been constructed by these countries. After 1918, Italy obtained the Istrian peninsula with Trieste, while Fiume became a bone of contention between Italy and the new state of Yugoslavia. After 1924, Fiume also came under Italian rule, while Yugoslavia developed Sušak, a suburb of Fiume, into a busy port. Both Trieste and Fiume are largely Italian speaking, together with the western coastlands of Istria, but the countryside is mainly inhabited by Croat- or Slovene-speaking peoples. Thus the whole region suffers from acutely conflicting national and economic interests. Since 1945, Yugoslavia has been in possession of the Istrian peninsula and Fiume, and has laid claim also to Trieste.

B—THE APENNINE PENINSULA

It cannot be said that any very satisfactory division into geographical regions presents itself, for the rapid alternation of high and low relief results in a veritable mosaic of contrasting land-forms and climates. A primary division into central and southern Italy can be justified to some extent on climatic and other grounds and will be adopted for the sake of convenience in treatment.

Central Italy. (i) The Apennines. *The Northern Apennines and Ligurian Alps.* These mountains present an obstacle to communication between the great plain of northern Italy and the Ligurian Sea on the one hand, and between the great plain and the small fertile basins of peninsular Italy on the other. But it is a narrow barrier (about twenty-five miles), and heavy weathering has produced a number of passes.

Behind Genoa (It., Genova) there are several routes inland, though the road over the Bochetta pass rises to 5,650 feet above sea-level, and the railways have numerous tunnels. From a tectonic point of view the Ligurian Mountains belong in their western section, roughly west of Savona, to the Alps, but from a geographical point of view they may be treated as a simple extension of the Apennines. The Ligurian Mountains border the sea so closely that the houses of the main residential parts of Genoa are perched on the steep slopes behind the scanty lowland on which lie the present business quarters and the old town. Practically all agricultural land has had to be obtained by terracing. The absence of any coastal plain is evident from the fact that the coastal railway between Genoa and Ventimiglia, on the Franco-Italian frontier, passes through more than seventy tunnels, while the many mountain torrents which had to be bridged added to the difficulty of construction. Owing to the protection given by the mountains against cold northerly winds, the coastlands present a southern vegetation with olives, tangerines, palms, etc., but the rainfall is high (Genoa, 52 inches) and there is no dry season. There are many tourist resorts, but commercial and industrial interests are centred in Genoa (649,000), which is the main port for the North Italian Plain. Although any extension of its harbours can only take place at the expense of the sea, yet Genoa is free from the continuous fight against silt which has almost defeated Venice, and has the further advantage of being nearer to the industrialised western end of the North Italian Plain. It is the chief port of Italy for goods traffic, and stands next to Marseilles and Naples among Mediterranean ports for passenger traffic. Its suburbs possess ironworks, and there are similar factories at Savona

and smaller places along the coast. The use of scrap iron and British coal explains the coastal position of these factories.

East of Genoa the Ligurian Mountains are higher and broader and consist of numerous chains trending from north-west to south-east, roughly parallel with the coast. Communication across these chains is difficult, hence Spezia (122,000), though possessing a splendid harbour, has no long commercial history behind it, and though it is now connected by rail with the North Italian Plain, it is used chiefly as a naval port.

These mountains continue between the River Taro and the River Metauro as the Northern Apennines. The chains have a north-west to south-east strike and consist mainly of soft sandstone, clays, and chalk marls, together with narrow bands of serpentine. The country is highly dissected, hilly rather than mountainous, since the



[Courtesy Touring Club Italiano]

FIG 20 —THE "BADLANDS" OF SASSUOLO IN THE TUSCO-EMILIAN APENNINES.

rocks do not lend themselves to harsh forms, and landslides are frequent in the clay zones. The western stretch between the River Taro and the Pistoia-Bologna railway, however, has considerable areas over 3,000 feet, and Monte Cimone reaches 7,097 feet. The landslide type of country produces "badland" topography, so-called from the similar formation which prevails on a large scale in South Dakota (U.S.A.). The northern side is seamed with many short, transverse valleys, but on the inner side are developed longitudinal valleys with the characteristic north-west to south-east strike, and these lead down on the south to the basins of Tuscany, and on the north lead up to easy passes. Communication is, therefore, relatively easy, apart from the danger of landslides, and there are many historic routes between the Florentine basin and the North Italian Plain. The older railway line follows the Reno

valley, south of Bologna, but a newer and more direct route goes farther east, between the Reno valley and the Futa pass, though this involves much tunnelling, the second longest tunnel in Europe ($11\frac{1}{2}$ miles) being on this line.



[Photo Margaret R. Shackleton]

FIG. 21.—VALLOMBROSA IN THE WOODED TUSCAN APENNINES.

Situated about fifteen miles east of Florence, at a height of over 3,000 feet, this former monastery is now used as a Forestry School. The view was taken in April and heavy snow had fallen during the previous day, a patch being still visible on the sky-line.

The Northern Apennines carry considerable forest, especially towards the west. Precipitation occurs all the year round, and snow may fall in April or even later, so that deciduous trees prevail,

especially the sweet chestnut and beech, while the summits are clothed with conifers. The "autumn leaves of Vallombrosa" strew the ground as thickly to-day as in Milton's time.

The Central Apennines. South of the Northern Apennines (*i.e.*



FIG 22.—CENTRAL ITALY: MORPHOLOGICAL DIAGRAM.

roughly south of a line joining Perugia and Ancona), the mountain belt begins to widen and to change in lithological character, though on the west two parallel chains continue the same types of rock into Umbria.

Eastward, however, begin the limestone ranges which predominate

throughout the rest of the system as far as the granitic mass of Sila in Calabria, and which are especially high and rugged in the Abruzzi, where Monte Corno, in the Gran Sasso Range, reaches 9,560 feet. The highest of these limestone mountains present Alpine features, but generally they form formidable blocks whose steep, rugged sides are crowned with plateau-like or rounded surfaces (It., *piani*). Considerable karst areas have been developed owing to the porous character of the limestone, and usually the higher limestone chains and massifs now carry only thin scrub and sheep pasture. The zone is penetrated by longitudinal depressions such as the upper Tiber valley, the basins of Foligno and Rieti, the valleys of Aterno



[Courtesy Touring Club Italiano]

FIG. 23.—OPI IN THE APENNINES OF THE ABRUZZI.

A hill village typical of many in the Mediterranean region.

and the upper Liri. These allow penetration, and when drained are themselves of great fertility. It is, however, much more difficult to cross the peninsula from sea to sea in the Abruzzi than farther north, owing to the greater height of the mountains and the poverty of transverse valleys, the latter being due to the incomplete system of surface drainage in this country of porous limestone.

The Central Apennines are thinly populated, except in a few fertile basins, such as those mentioned above, and in the enclosed Fucino basin (sixteen miles long by ten miles wide), which was covered by a lake until the middle of the nineteenth century. Cultivation is confined to the alluvial deposits of the basins and to the terraced sides of the valleys.

The Eastern Slope of the Apennines. The land between the high Apennines and the Adriatic descends by a series of not very well defined terraces, and is a region of very complicated dissection developed in almost undisturbed young Tertiary clays, shales, and sands.

The topography is mainly the result of river-work, the consequent streams being separated from each other by parallel residual ridges, though these are cut up in turn by innumerable minor valleys. In spite of a tendency for the clays to slip, it is a fertile, well-cultivated region with about 70 per cent. of the surface under the plough, with wheat, sugar-beet, and maize being the chief crops. The vine is widely cultivated, but there are few trees except near the coast where mulberries and olives are grown; it appears that the compact clays are unfavourable to tree growth, as they crack and dry out badly in the droughty summer. Although the region is thickly populated there are few large centres. This is due to a variety of reasons. The concordant coast, bordered by low cliffs or deltaic formations, is harbourless, except for the port of Ancona (c. 53,000), where a limestone promontory occurs and gives rise to a bay. Secondly, owing to the large number of independent rivers there is an absence of nodal points. Thirdly, it is not the "custom of the country" to live in large agricultural towns, as in the similar lands in the interior of Sicily, but in small ridge-top towns and villages, and in scattered farmhouses.

Central Italy. (ii) The Sub-Apennine Region. Between Spezia on the north, Monte Circeo on the south, and the Apennines on the east lies a particularly broad segment of the Apennine foreland. Although in places it reaches heights comparable with the Apennines themselves, it is generally lower, more fertile, and includes some of the most densely populated areas in the whole of Italy. Its curving eastern margin is well marked by the depression of the Val di Chiana, by the longitudinal middle course of the Tiber, and by the Sacco and Liri valleys, but the hill-country of Umbria may also be included from the geographical, though not from the geological, point of view (*see* Fig. 22).

The Sub-Apennine region consists of a number of fragments, formerly separated by arms of the sea, but now joined together by depressions, which are filled by Quaternary sediments and by alluvium. These depressions contain considerable deposits of brown coal and lignite. The Sub-Apennine region is mainly hilly country studded with basins and narrower lowlands, but is so very diverse that it is particularly difficult to give any generalised description, and maps on a scale of at least 1 : 100,000 are necessary for its study.

The Arno Basins. The former lake basins (of which Lake Trasimeno is a shrunken remnant) along the Valdarno and Val di

Chiana are highly cultivated, densely populated and afford valuable routes, but they are surpassed by the lower basins, particularly by that associated with Florence (It., Firenze; 373,000) and Pistoia (30,000). This was still marshy as late as early Roman times, and the early centres of population, such as Fiesole and Pistoia, were placed on high land round the margins. The floors of these basins are of great fertility, and so are many of the neighbouring hills, the Monti Chianti, for instance, being celebrated for their wine. It may seem curious that no city in the neighbourhood came into real prominence until mediæval times, since Florence in many respects has a



FIG. 24.—FLORENCE AND THE RIVER ARNO.

With its magnificent Renaissance buildings and art collections, Florence is a monument to the part played by Italy in European civilisation. The modern Italian language and literature emanated from Florence.

better position than Rome for acting as capital of Italy. But this Etruscan region was prevented from enjoying its advantages of position by a number of disadvantages, among which may be enumerated the presence of the early marshes, the openness to attack from barbarians arriving from the north, and the late development of the North Italian Plain.

Mediæval Florence owed its wealth primarily to the fertility of the surrounding country and to the good use made of its nodal position giving access north over the Apennines, south *via* the Val di Chiana, and west *via* the *Ârno*. The manufacturing, banking, and

artistic ability of the Florentines brought the city wide fame, but the present town is mainly prominent as a tourist centre. The Arno has built a delta at its mouth whose continued growth has led to the decay of Pisa as a port, and the town of Leghorn (It., Livorno; 137,000) has taken its place. The delta was formerly malarial, but is now almost immune from this disease.

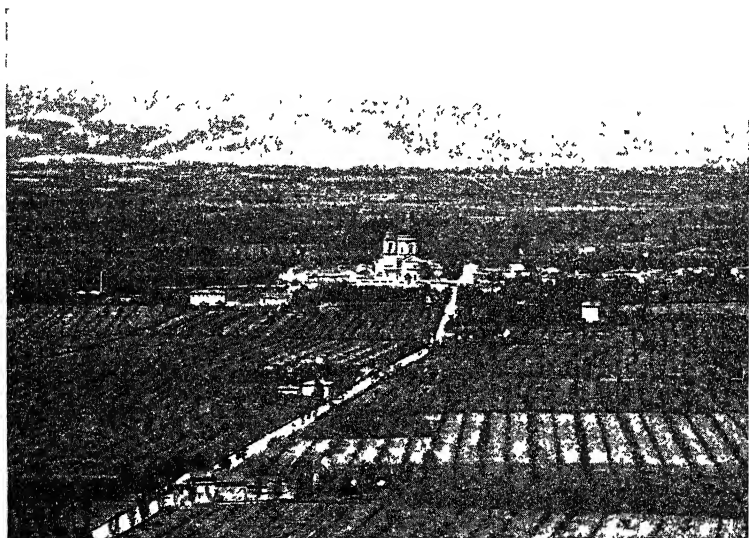
The Alpi Apuane. North of the Arno delta stretch the Alpi Apuane, separated by a depression from the Northern Apennines. Reaching heights of over 6,000 feet, these form one of the few really high and mountainous parts of the Sub-Apennine zone, the Triassic limestones of which they are largely composed having weathered into rugged forms. In places the limestone has been altered into marble which supplies the famous Carrara marble used in sculpture. The heavy precipitation is favourable to forests, and the sweet chestnut covers a greater area here than in any other region of Italy.

The Hill Country of Tuscany. South of the Arno lies the hill country of Tuscany (It., Toscana) with Siena (c. 48,000) almost centrally placed. It is a complex region, mainly from 1,000 to 3,000 feet high, consisting of (a) the western heights bordering the Maremma or coastal lowlands, (b) the Siena Trough, and (c) the southern area. The western heights consist of dissected plateaus of infertile Tertiary sandstones with older rocks outcropping in places, especially in the *Catena Metallifera Toscana*, or Tuscan Ore Mountains, which contain fragments of rock as early as Permian. Igneous intrusions, associated with fracturing, have cut through all the strata up to the Eocene, and many minerals such as copper, silver, zinc, iron, tin, and mercury are associated with these veins. Of these, only mercury is mined to any extent at the present day, though many of the others were of great historic and pre-historic significance. The Siena trough is filled mainly with Pliocene rocks (clays, sandstones and limestones), occupying the site of a former arm of the sea. It provides an alternative line of communication between Rome and Florence, but is not so important as the Tiber-Val Chiana route. Though lower and more fertile than the western heights, the Siena trough is mainly over 1,000 feet high, and varies between gently undulating and desolate, highly dissected country, whose rocks are subject to landslides. Siena, the only town of modern importance, is a route centre as well as attracting large numbers of tourists. The southern region, south of the River Ombrone (not to be confused with the other Ombrone, a tributary of the Arno) rises to a height of 5,690 feet in the trachytic cone of Monte Amiata, but generally speaking the region is a dissected plateau, similar to the western heights.

Owing to the infertile soils, the population density of the Tuscan

hill country is low for Italy, being less than 128 per square mile over the greater part of the area, *i.e.* about the same as in the high Apennines. Agriculture is on traditional lines, wheat, vines, and olives being dominant, with a good deal of *macchia* and rough grazing on the highly dissected stretches of country and considerable forests on the higher land.

The Umbrian Hill Country. The hill country of Umbria belongs structurally to the Apennines, as it lies to the east of the Val Chiana-middle Tiber trough but, in virtue of its many fertile basins, ease



[Courtesy Touring Club Italiano]

FIG. 25.—THE PLAIN OF ASSISI, UMBRIA.

This small fertile plain surrounded by hilly country is typical of many in Peninsular Italy. The view is taken from the town of Assisi, which is characteristically built on a hill.

of communications, and historic towns, it belongs culturally to the pre-Apennines, and strongly resembles the Arno region of Tuscany. The landscape consists of rather flattened hill-ridges, mainly of sandstone, which reach to heights of about 3,000 feet, and which are threaded by interconnecting basins of great fertility (*see* Fig. 25), drained chiefly by the upper Tiber and its tributary the Nera. The chief towns are Perugia (32,000), a route and agricultural centre; the smaller but similar Spoleto (11,000) and Foligno (11,000); Terni (37,000) celebrated for its waterfalls, hydro-electric plant, its metallurgical and electro-chemical industries; while Assisi (5,000)

and many other picturesque small centres have considerable historical interest.

The Volcanic Region of Latium. Latium (It., Lazio) consists essentially of a dissected plateau built up of calcareous tufa and volcanic ash, above which rise a number of lofty old volcanoes, many of which are filled by crater lakes such as L. Bolsena, L. Vico, L. Bracciano and L. Albano. To the south-east, however, the Monti Lepini are composed of limestone. The volcanic plateau is divided into two parts by the lower Tiber, which traverses a broad saddle between the Monti Sabatini and the Alban Hills, and has cut down to the Tertiary clays. This saddle, including the flood-plain of the lower Tiber, forms the Campagna Romana. Farther north the plateau drops down to a marshy coastal zone, similar to the Tuscan Maremma, while the Lepini Hills are fronted by the Pontine Marshes. Apart from Rome itself and the fertile Alban Hills, the whole area is rather desolate and scantily populated country with a high percentage of rough grazing devoted to sheep, though the malarial coastal lowlands, including the Pontine Marshes, were reclaimed and rendered healthy and productive under land improvement (*bonifica integrale*) schemes, dating from 1928.

The city of Rome (It., Roma; 1,695,000) grew up on seven steep little residual hills of volcanic material, but the fact that the Tiber here breaks through the hilly Apennine Foreland was one of the principal factors in the evolution of the city. Rome was essentially a route centre. The river was easily navigable up to this point, while an island in the river facilitated bridge-building. The "cult of communications" was fostered by the chief priest being also the chief bridge-builder, *i.e.* "Pontifex Maximus."

Rome was in the best position of any town in Italy to gain control of the whole peninsula in early times, since it stands on the largest river with the most extensive drainage area, and is centrally placed in regard to the length of the peninsula. At the present day the centre of gravity of the country, as regards population, education, and wealth, lies not in the peninsula at all, but in the North Italian Plain, and the choice of Rome as capital of the whole country in 1870 must be looked upon as a tribute to the glory of its historic past. In population it was, until very recently, smaller than either Milan or Naples, but it is growing rapidly as a result of its restoration to the position of capital, and is now the largest city of the country, being the supreme administrative and religious centre and possessing the largest university in Italy.

Southern Italy. Between southern and central Italy there are a number of differences which, though not very marked in themselves, have the cumulative effect of producing a different environment.

New landforms appear, notably the platform of Apulia, the crystalline moorlands of Calabria, the active volcanic areas of the Neapolitan region. The climate also differs somewhat in having rather warmer winters and drier summers, thus further restricting the extension of broad-leaved trees, but allowing the cold-hating orange to flourish, which it cannot do even in central Italy or the Riviera. Further, southern Italy is backward culturally, having been unintelligently exploited by its Hapsburg and Bourbon masters up to the middle of the nineteenth century. It has poor communications and is undeveloped industrially.



[Photo: Margaret R. Shackleton]

FIG. 26.—VESUVIUS: THE INNER CONE.

Vesuvius is the only active volcano on the mainland of Europe.

(i) **The Neapolitan Lowland.** In southern Italy the Apennines cross over once more to the west coast, leaving a broad foreland on the east, but on the west allowing only the development of the Neapolitan lowlands and the small plain bordering the Gulf of Salerno. The Neapolitan lowlands (*terra di lavoro*) are encumbered by the active volcanic areas of Vesuvius and the Campi Flegrei, but are very fertile (partly as a consequence of the volcanic material), and intensively cultivated. In addition to a profusion of fruit trees and vines, early vegetables and tomatoes are grown on a large scale under irrigation. Naples (It., Napoli; 1,028,000) is one of the

three largest Italian cities, and grew to importance as the administrative centre of the kingdom of Naples, or the "Two Sicilies." It attracts large numbers of tourists and has started new manufacturing industries, such as cotton and jute, metallurgy, engineering, and chemical, in addition to the preparation and preserving of food products. It possesses a magnificent harbour and is the second port of the country as regards tonnage, mainly owing to its passenger traffic, large ships of 60,000 tons being able to lie alongside its quays.

(ii) **The Southern Apennines** differ somewhat from those of central Italy in showing few parallel chains, but many isolated blocks. This is consequent upon less intensive folding, but more numerous dislocations. In the Calabrian Apennines even the Eocene strata are unfolded, though they represent *par excellence* the folded rock of the northern Apennines. The numerous depressions are filled with Pliocene and later material, and the one affording a route *via* Benevento, between the Neapolitan district and the east coast, is the most important. On the whole, the southern Apennines are lower than those of the centre, but Serra Dolcedorme reaches 7,451 feet. The crystalline plateau masses of Sila and Aspromonte take up almost the whole of the Calabrian peninsula. They were probably once covered with both Mesozoic and Tertiary material, but this has been denuded from the summits of the plateaus, though it is still found high up on the sides with consequent high extension of cultivation. The granite, gneiss, and mica schists, of which these masses are composed, carry many trees, such as sweet chestnuts, oaks, beech, and pine.

The high crystalline plateaus, reaching to heights of 6,000 feet and more, have a fairly heavy precipitation throughout the greater part of the year, and lie under snow for some three months every winter; with their patches of woods and moorland, they afford a strong contrast to the bare, steep sides of the massifs, and to the semi-tropical vegetation of the coastal lowlands. There is seldom a true coast plain, but marine terraces at various heights give some fairly flat surfaces near the coast, though they are often badly seamed by gullies and gorges. The variation in the volume of the rivers between winter and summer is even more pronounced here than in the central Apennines, and many (known as *fiumare*, cf. *wadis*) are completely dry in summer. Oranges, lemons, olives, vines, and figs are widely grown on the lower slopes, and the small amounts of arable land are devoted to wheat and vegetables. Reggio (138,000), the crossing place to Sicily, is the chief town.

(iii) **The Apulian Foreland.** Apulia (It., Puglia) consists mainly of a platform of unfolded or lightly folded Mesozoic limestones,

and until geologically recent times it was separated from the Apennines by an arm of the sea. These late Tertiary and recent marine sediments form a hilly corridor between the Gulf of Taranto and the Tavoliere di Puglia, where they spread out widely into a broad plain. On the whole they give rise to rather useless country, since they consist of sandy and gravelly material in the coastal plains bordering the Gulf of Taranto, and of highly dissected hills subject to landslips in the corridor, and since reckless deforestation has ruined whatever value this dry area once possessed, it is not surprising that population density is very low. The Tavoliere, however, is in process of reclamation. This "chess-board" (about 60 miles long by 30 miles wide) is floored by Pliocene clays with a covering of sands and gravels, and in consequence is apt to dry out in summer and to become water-logged in winter; it was therefore devoted mainly to winter pasture for sheep which were taken in the summer to the mountains of Abruzzi and Molise. As the rivers dry up or are reduced to a mere trickle in summer, drinking water is scarce, so the region is not an easy area to live in; nevertheless, a good deal has now been reclaimed and devoted to wheat cultivation, and the great Apulian aqueduct and its ramifications now supply part of the Tavoliere.

The Apulian aqueduct is one of the great engineering works of Europe. Work was begun in 1906, but the whole scheme was not completed until 1939. It involves the diversion of water from the westward-flowing River Sele by means of three tunnels, each about $9\frac{1}{2}$ miles long, through one of the Apennine ridges. The main aqueduct, which runs through Apulia parallel to, and about 15 to 20 miles inland from, the Adriatic coast is over 150 miles long and there are about 1,500 miles of subsidiary channels. At least two million people in one of the driest provinces of Italy are supplied with water by this means.

In spite of its lack of rivers, and until recently of good drinking water, the limestone plateaus of Apulia are fertile, well cultivated and thickly populated, especially in the Murge. The limestone is mainly concealed by fertile soil, while in places, especially in the "heel" of Italy south of Brindisi, the true "terra rossa" occurs. The best soils are devoted to wheat, of the hard durum type, vines and olives are widely grown where soils are shallower or the ground more stony, while oranges, lemons, and other fruit trees are grown along the coast. Monte Gargano is similar in character to the Murge, but less productive.

Apulia shows the striking grouping of even the agricultural population into towns, which is characteristic of southern Italy and Sicily. Ninety-three per cent. of the population is in nucleated

settlements, of which Bari (253,000), Taranto (181,300), and Foggia (57,000) are the largest. Brindisi (36,000) is the well-known passenger port for Egypt and the Far East.

(iv) **Sicily.** Sicily continues the Apennine region, from which it is separated by the Straits of Messina which are less than two miles wide at their narrowest point. Along the northern coast of the island stretch the Sicilian Apennines, mainly formed of sandstones and limestones, but containing the gneissic massif of Peloritani in the north-east corner. The mountains usually fall steeply to the north coast, but leave room for one or two small plains, of which that of Palermo has been celebrated for its beauty and fertility since ancient times. Palermo (458,000) is the chief port of the island, and communicates by rail across the mountains with the south coast.

The centre and south of the island consist mainly of a former peneplain of young Tertiary material, denuded into a region of rounded hills. Limestone and Flysch strata occasionally emerge, and young volcanic material appears in the south-east while Mount Etna stands apart as a region on its own. This hill country was one of the great granaries of the ancient world and still produces much wheat, but it has an unprepossessing appearance, its treeless and hedgeless cornlands stretching monotonously over hills and valleys, while it is notoriously dry and dusty in summer and early autumn. Wheat is almost a monoculture, though chick-peas and lentils figure in the rotation, and some barley is also grown. In contrast, the coasts of Sicily have a luxuriant vegetation, with olives, vines, figs, almonds and other nuts (*e.g.* pistachio and hazel) growing in abundance, while the irrigated land is devoted to orange and lemon trees, and vegetables, such as tomatoes and artichokes.

The active volcano of Etna is separated from both the Apennines and the Tertiary hill-country by tectonic depressions. It rises sheer from the sea to a height of 10,739 feet, and its summit is covered with snow for the greater part of the year. Its lower slopes produce large quantities of vines and olives and are densely peopled. Extensive sulphur deposits occur in the middle of the island, between Caltanissetta and Agrigento (Girgenti).

Sicily, like Apulia, shows to a remarkable extent the characteristic concentration of the Mediterranean people into towns, even of the agricultural section of the population. Hence the astonishingly large size, for a small, purely agricultural area, of, *e.g.*, Messina (215,000), Catania (277,000), Trapani (52,000), Caltanissetta (37,000), Syracuse (44,000).

The Tyrrhenian Islands. Sardinia, Corsica, Elba, and the tiny Tuscan islands show a high proportion of infertile crystalline material, and are mainly mountainous.

The eastern half of Sardinia consists of mountainous country composed of granite, covered with heath and maquis, carrying only a scanty population engaged in sheep and goat rearing. This region sinks westward to a hill country, largely composed of volcanic material, and north-westward to the plain of Sassari (55,000). The north-west corner consists of a hill county of folded Palæozoic and Cretaceous material. On the south-west the crystalline mass sinks to the Campidano, the largest plain of the island, which crosses from the south coast at Cagliari (134,000) in a north-west direction to the west coast near Oristano. This plain is one of the most malarial districts of Italy, but is being taken in hand in connection with the important irrigation and hydro-electric scheme which has involved a great dam across the River Tirso. The south-west corner is a folded mountain zone of very varied material, varying from Palæozoic to Tertiary together with volcanic. Lead and zinc have been mined from early times. Sardinia is generally an unproductive and thinly populated country, and offers great contrasts to Sicily in both respects.

Corsica's granite mass lies on the west side of the island and sinks to a ria coast. The north-eastern side consists of folded mountains of a shaly character, separated from the granitic area by a longitudinal depression, which, however, is smaller and less important than that of Sardinia, and the population generally is even scantier. Population tends to avoid the narrow malarial coastlands and is mainly to be found in the zone between the 600-foot and 3,000-foot contours. About half the island is covered with maquis, which is often exceptionally tall and well developed here. The island of Elba consists of very varied material which contains considerable deposits of iron ore in the east associated with granitic intrusions. The tiny Tuscan islands are composed chiefly of granite.

Economic Summary. Italy, with an area of 116,000 square miles and a population of 47 million at the Census of 1951 (1947 estimate= 46 million), is about the same size and has about the same number of people as Great Britain, but has a much greater proportion of its inhabitants engaged in agriculture (47 per cent. as against 6 per cent.). The more favourable latitude partly accounts for this greater emphasis on agriculture, but also it must be remembered that Italy has very little coal and iron ore, and was, therefore, handicapped as regards manufactures.

Small supplies of minerals. Italy has an annual production of only about 800,000 tons of coal (bituminous and anthracite) and another 800,000 tons of lignite, taking a five-year average, 1934-38. Or the coal, about half a million tons comes from Sardinia and most of

the rest from the Val d'Aosta in the western Alps. The lignite occurs mainly in Miocene and Pliocene deposits of the ancient straits and basins, and is mined chiefly in Tuscany (Valdarno and the Tuscan hill country near Volterra and Grosseto), and between Spoleto and Terni in Umbria. The insufficiency of these supplies is emphasised by Italy's import of 12 million tons of coal annually in pre-war years. Iron ore is likewise deficient, the deposits being both small and scattered. Of the three-quarters of a million tons mined annually, most comes from two sources, Elba and the Val d'Aosta, while a little is obtained along with pyrites in the Catena Metallifera of Tuscany. Scrap-iron, pig-iron, and steel ingots were imported to the extent of some half to three-quarters of a million tons annually. Italy also lacks mineral oil, except for very small quantities, copper and tin, and although these commodities could easily be imported in a less divided world, currency and other difficulties impose restrictions.

The minerals which Italy possesses in quantity are not so important industrially as those mentioned above, though at least two of them, bauxite (for aluminium) and sulphur (for sulphuric acid), have become of much greater importance in recent years through the application of electrical processes. Italy came second only to the U.S.A. as a world producer of sulphur, with an annual output of one-third of a million tons (2 million tons of rock), coming mainly from Sicily. Italy ranked sixth as a world producer of bauxite, with an average annual output (1934-38) of 322,000 tons, mainly from Istria (now lost), the Apulian heel of Italy and M. Gargano. Other minerals include mercury, of which Italy and Spain possess a virtual European monopoly; it was mined chiefly at M. Amiata in Tuscany and at Idria (c. 30 miles N.E. of Trieste). There are smaller deposits of lead and zinc, mica, manganese, antimony, and magnesite.

The Development of Modern Industry. Up to the unification of Italy in 1861, Italy was in an unfavourable position politically for the development of manufactures, since there were five customs zones and the home market of each was therefore very small. Also, at the time of the formation of the Italian kingdom there were hardly any survivals of the great mediæval manufactures which had made central and northern Italy the workshop of Europe. With the tariff unification of 1861 came the opportunity of a large home market, and the presence of a large amount of clever cheap labour and a favourable position on the Mediterranean route for importing British coal enabled Italian industries to begin development on modern lines. A second great impulse came at the beginning of the twentieth century, with the discovery and development of

the electrical transmission of water power.¹ Hydro-electric power was first widely used in the textile industry, but has since been applied on a large scale to the electro-metallurgical, engineering, and electro-chemical industries. By the 1930's, Italy was the greatest producer of hydro-electricity in Europe, with an output of about 10 million kilowatt hours; this had risen to 14½ million kilowatt hours in 1938, and about 17 million kilowatt hours in 1947. Over three-quarters of this was developed and utilised in northern Italy, where the main industries are situated. In the 1930's the electro-chemical and electro-metallurgical industries consumed about 33 per cent. of the electricity output, other industries about 44 per cent. (though included in this latter figure is the textile industry which consumed only about 10 per cent. of the total). Of the remaining amount, about 10 per cent. was used for traction (large sections of the Italian main railway lines being electrified) and 10 per cent. for lighting; only about one per cent. was used in agriculture.

The manufacturing industries absorbed about 30 per cent. of the employed Italian population, with another 12 per cent. in commerce and communications. The chief branch of industry was the textile, with about 600,000 workers. This is mainly situated in northern Italy (in Lombardia, Piemonte, Venezia Euganea, Liguria and Emilia), with isolated centres in the lower Arno and Neapolitan regions. The cotton industry alone employed over 250,000 workers, though it held only fifth place in Europe as regards output. Silk and rayon were manufactured on a large scale, Italy being the chief European producer of real silk and silk yarns, while it came either second or third in rayon production. Wool, hemp, and jute were also manufactured. The clothing industry absorbed another half-million workers, but these were mainly engaged in small establishments.

The Italian metallurgical industry, owing to the shortage of coal and iron, tended to be concerned mainly with the manufacture of machinery rather than with heavy industry, though iron and steel production was carried on to some extent at a number of ports and in some isolated centres, such as Aosta and Terni. The engineering industries are located in the same provinces as the textile industries, for the same reasons of access to water-power, ease of communications, and abundance of labour. Well-known branches were the automobile, aeronautical, and shipbuilding industries and the making of textile, agricultural, and electrical machinery. The

¹ It may be noted that Italian scientists were pioneers in electrical research of various kinds, *cf. galvanometer* after Galvani, *volt* after Volta, whose statue may be seen at Como, while the name Marconi is a household word.

chemical industry is the most modern of Italy's major manufacturing industries and relies chiefly on the large supplies of hydro-electricity available, though the abundance of sulphur is also an asset. Typical branches are the manufacture of sulphuric acid, calcium carbide, calcium cyanamide, caustic soda, and superphosphates. The Italian production of sulphuric acid was about the same as that of England, the two countries vying for third position among European producers.

Food-processing constitutes a very important branch of Italian industry. Italy was second only to France as the world's greatest producer of wine, second to Spain as the greatest producer of olive oil, and second to Germany as a cheese producer. Her production of alimentary pastes, beet-sugar, and tobacco was also very large, while the canning of tomatoes, various fruits, and fish had made great strides in recent years.

Imports and Exports. Italy ranked as sixth European country in 1938 for volume of external trade, and thirteenth among all the countries of the world. Manufactured goods figure largely among the exports in normal times, and account for over 40 per cent. of the total, with textiles, motor-cars, machinery, and rubber goods making up a large share. High-priced foodstuffs account for about one-third of the exports, with lemons, oranges, canned tomatoes, wines, and many other kinds of fresh and preserved fruits figuring largely. The export of raw silk had declined owing to the development of silk manufactures in the country. Italy's "invisible exports" included remittances from Italians abroad and the earning power of her mercantile marine.

It may be noted here that Italy's mercantile marine underwent great expansion after 1918, and ousted France from fourth place among European countries as regards tonnage of shipping, with a total of 3,213,000 tons in 1937.

The import list used to be headed by wheat, but in 1933 the country became practically self-supporting as regards this cereal, and the imports of wheat have since been small. Minerals (including coal and coke), raw cotton and raw wool held important places, followed by manufactured products of various kinds, e.g. mineral oils, machinery, cast-iron, and steel.

The Population Problem and Land Reclamation. In spite of the development of manufactures, the country can hardly support its 360 people per square mile, and there was a large-scale emigration from about 1860 to 1924. This provided a temporary solution for the problem of over-population, some half a million people emigrating annually from 1900 onwards, mainly to U.S.A., Brazil, Argentina, and France. About 8 million Italians left the country between 1901

and 1913, and after the war of 1914-18 emigration of large numbers recommenced until the severe restrictions imposed by many of the receiving countries, and especially by the U.S.A., slowed down the process to a mere trickle from 1925 onwards. As the Italian colonies were not capable of absorbing large numbers of immigrants, the

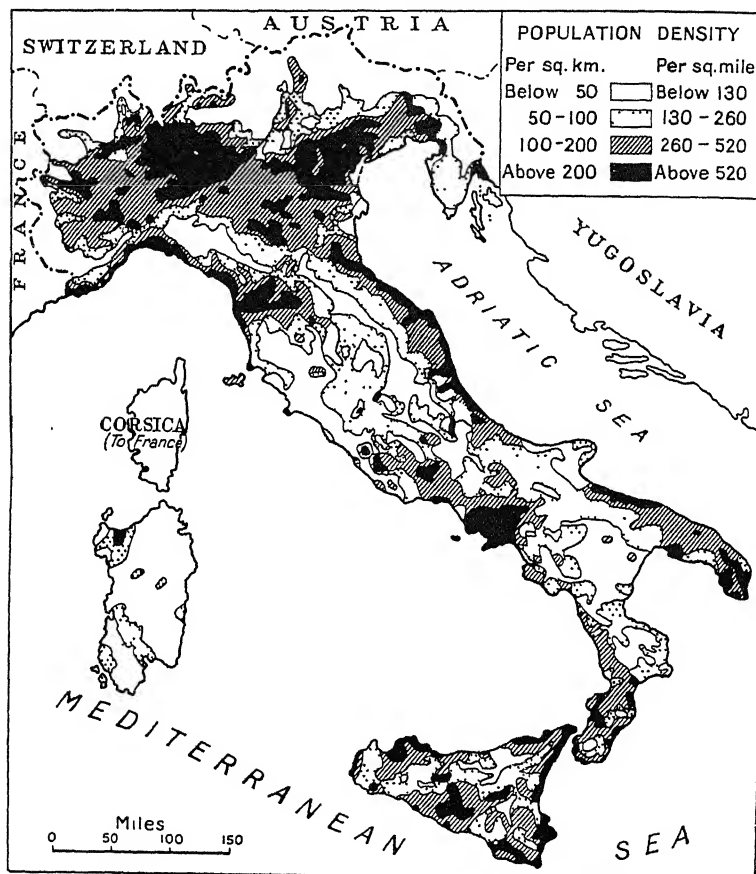


FIG. 27.—THE DISTRIBUTION OF POPULATION IN ITALY. [After R. Almaga

NOTE: The frontiers shown are pre-1939, and Sardinia is omitted.

only "safety-valve" remaining was France, which received about a million Italians between 1919 and 1927, though many of these were only temporary sojourners.

Partly as a consequence of the immigration restrictions and partly owing to a change of viewpoint about the loss of man-power, the

Italian government during the later 1920's embarked on a policy of wide-scale land reclamation and improvement. The lands most obviously in need of improvement were the marshy and malarial lowlands (a) along the west coast, (b) in eastern Emilia, and (c) in Sardinia which, when reclaimed, could speedily be brought under the plough. Costly schemes of drainage, irrigation and stream control were carried out, while the incidence of malaria¹ was greatly reduced. Less immediately profitable, and perhaps more difficult to handle, is the problem of reclaiming mountainous districts which had suffered from deforestation and erosion, though some progress had been made in this direction. By 1940 work was completed or in hand on about 22,000 square miles, *i.e.* about a fifth of the total area of Italy, though the areas of intensive reclamation were smaller. For instance, the Pontine Marshes scheme involved the improvement of some 350 square miles, including the drainage of marshes, clearing of woodlands, construction of drainage and irrigation canals, preparation of the soil and the construction of roads, townships, and farmhouses. Even so, the numbers of farmers capable of being absorbed by these schemes is not large, and with a high birth rate (*c.* 23 per thousand) and only a medium death rate (*c.* 14 per thousand), Italy had an average annual increase of some 400,000 persons. Italy, of course, is only one of the many countries of Europe which suffer from a similar problem of over-population.

¹ The Institute of Malariology at Rome is one of the most important in the world.

MAPS AND REFERENCES

Atlanti dei Tipi Geografici (Atlas of Geographical Types), by O. Marinelli (Florence, 1922), gives maps of typical landforms, but the much smaller *Saggio di un Atlante del Paesaggio Italiano* (Essay of an Atlas of Italian Landscape), with English text, is more useful as an introduction and gives excellent photographs of typical landforms. (Published by the Comitato Geografico Nazionale Italiano, Touring Club Italiano, Milan, 1928.)

There is no text-book on the regional geography of Italy in English. Tome III (Part 2) of the *Géographie Universelle* series, entitled *Italie, Pays Balkaniques*, by J. Sion (Paris, 1934), is an excellent modern work. *La Penisola Italiana*, by T. Fischer (Turin, 1902), may be looked upon as a standard work but is now rather out of date. There are sections on Italy in the books on Southern Europe given at the end of Chapter V. Nineteen volumes on the different natural regions are published under the title of *La Patria, Geografia d'Italia* (Turin, 1925-29).

A paper by Attolico and Giannini on "The Industrial Position of Italy" (*J. R. Statistical Society*, vol. 81, 1918) includes an account of the rise of modern manufactures in Italy. A paper in *Nature*, September, 1930, by Brysson Cunningham, gives an account of hydro-electric power. "La Mise en valeur de la Campagne Romaine," *Annales de Géographie*, September, 1929, "Water Conservation in Sardinia," *Geographical Review*, 1926, and "Reclamation of the Pontine Marshes," *Nature*, vol. 135, 1935, pp. 980-984, are among the many papers giving accounts of the recent great reclamation schemes. See also *Land Reclamation in Italy*, by C. Langobardi (London, 1936).

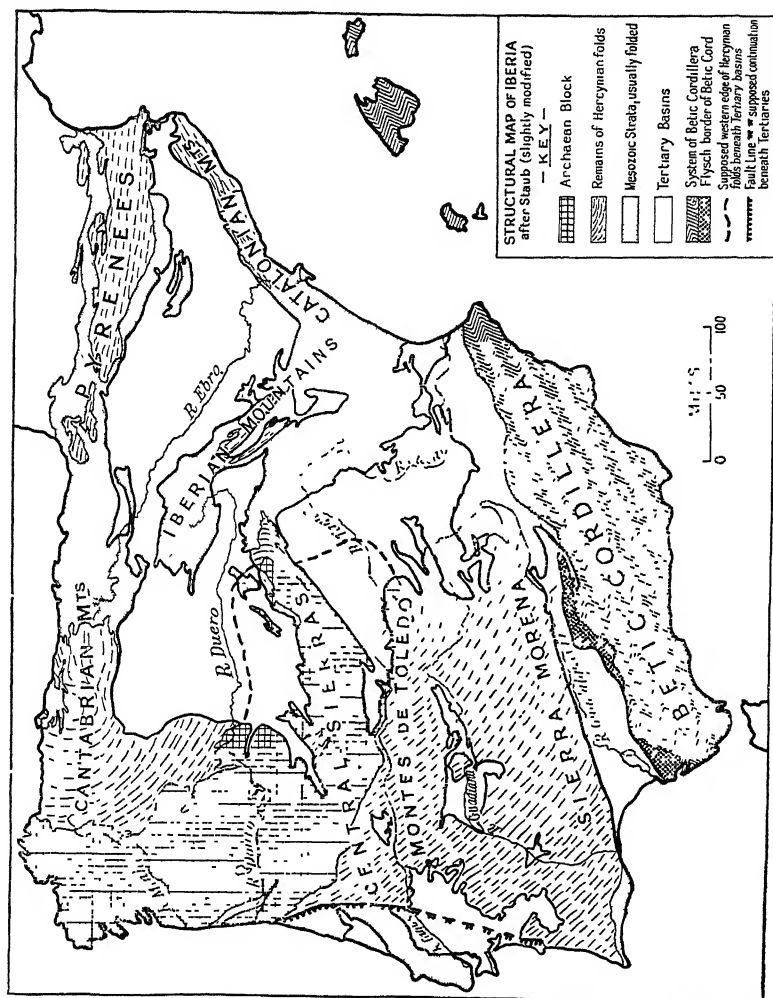
CHAPTER VII

THE IBERIAN PENINSULA

THE Iberian peninsula is the largest and most compact of the three southern peninsulas, and in contrast to the others it has the greater part of its area occupied by plateau. Consequently, in spite of being washed by the Atlantic Ocean as well as by the Mediterranean Sea, it is more continental than the Italian peninsula or than Greece and hardly less continental than the interior of the South-Eastern peninsula. The old saying that "Africa begins at the Pyrenees" sums up the plateau character, the aridity, the great treeless spaces, which are common to large sections of both regions, and the long sojourn of the Moors in Spain emphasised the likenesses between the Iberian peninsula and the lands on the southern side of the Mediterranean. The saying, however, is misleading, since the comparison is only with North Africa, and it is equally true that "Europe ends at the Atlas."

Relief and Structure. The greater part of the peninsula is occupied by a mountain-ribbed plateau, averaging about 2,200 feet high, known as the Meseta ("=table"), which slopes gradually westward to the Portuguese lowlands from the Iberian Mountains which form the main water-parting of the peninsula. The plateau is bordered on the north by the lofty Cantabrian Mountains and on its southern edge by the lower Sierra Morena. It is also ribbed by two lines of high sierras running from east-north-east to west-south-west, the northern line being known under various names, from the Sierra de Guadarrama in the east to the Serra da Estrella in Portugal, but may conveniently be termed the Central Sierras. The southern line, which is less imposing, is known in its two highest ranges as the Sierra de Guadalupe and the Montes de Toledo. The Central Sierras divide the plateau into two main basins, which are surrounded on all sides, with the exception of certain gaps in the west, by higher and more rugged country. The surrounding mountain ramparts fall abruptly on their outer sides either directly to the coast or to narrow coastal lowlands, as on the north and south-east, or to great depressions as on the east and south in the Ebro basin and Andalusian basin respectively. On the farther side of each of these depressions rise mighty mountain ranges, namely, the Pyrenees to the north of the Ebro basin, and the Betic Cordillera to the south

of the Andalusian depression. Coastal plains are generally absent, although the swampy threshold of the Andalusian or Guadalquivir depression borders the ocean, and there are lowlands midway along the Portuguese coast. There is also a conspicuous absence



[After Staub]

FIG. 28.—STRUCTURAL DIAGRAM OF IBERIA.

of deep bays and coastal indentations, except in the north-western corner of the peninsula, and in consequence good harbours are rare.

The structure of Iberia is a complicated one. Its geological history shows a long succession of mountain building extending

from Pre-Cambrian to Tertiary times, with intervening periods of peneplanation and sinking, but generally speaking, the land-mass grew by accretions eastward or south-eastward.

The north-western part of the peninsula, comprising Galicia and northern Portugal, shows the roots of a Pre-Cambrian folded system similar to that of the Baltic shield and consisting mainly of granites, gneiss, slates, quartzites, and crystalline schists. The greater part of the Central Sierras also shows these old rocks on the surface (see Fig. 28). There are traces of a folded zone of Caledonian age, but these are very scanty and completely overshadowed by folded rocks of the next great period of earth disturbance, namely, the Hercynian, which took place at the close of Carboniferous times. According to R. Staub, the Hercynian folds make a great S-shaped bend on the eastern edge of the Archæan block, with a pronounced change of direction at the eastern end of the present Sierra de Guadarrama. Large segments of this old double arc are concealed under the Tertiary deposits of the Central Meseta, so that certainty in the matter is difficult to obtain, and though Staub's hypothesis is very attractive, it is not accepted by many Spanish geologists nor by Stille.

From the close of the Palæozoic onwards the region experienced a tranquil period during which even the great Hercynian mountains were worn down to their roots. Seas and lakes covered much of the old surfaces, and in these, Mesozoic and Tertiary materials were deposited, though the north-western corner of the peninsula has apparently been above water since Pre-Cambrian times.

In spite of the early paroxysms mentioned above, the main lines of the present-day relief are due almost entirely to the mountain-building epoch which began at the close of Mesozoic times. At this period earth movements buckled the floor of the old "Mediterranean" Sea or "Tethys" into the true Alpine folds of the Betic Cordillera, which stretch from Cadiz to Cape de la Nao, and they also buckled up large parts of the more consolidated rocks of the "European" foreland to the north. The Pyrenees, the Basque Mountains, and the Cantabrian Mountains were formed at this time, though parts of these areas had already undergone folding in Hercynian times. The Iberian Mountains and Catalanian Mountains are also attributed to the Tertiary era, and even the Central Sierras, the Toledo Mountains, and the Sierra Morena were in part a response to these later thrusts.

Naturally the amount of folding or deformation that took place depended on the plasticity of the material involved, and as the ranges of the Meseta were re-formed out of tough old material, faulting rather than folding was responsible for the elevation of the Central

Sierras, the Montes de Toledo, and the Sierra Morena. On the other hand, the Pyrenees, the Iberian Mountains, and the Catalanian Mountains included much Mesozoic material previously unfolded, though both systems incorporated portions of the old massif. Apart from the Pyrenees, none of these chains shows the *nappes* or *decken* typical of the true Alpine folds, and even in the Pyrenees these are not well developed, so that fundamentally the mass of Iberia belongs to Hercynian Europe and is allied structurally to the central massif of France, the Bohemian massif, etc. This contrasts with the Betic

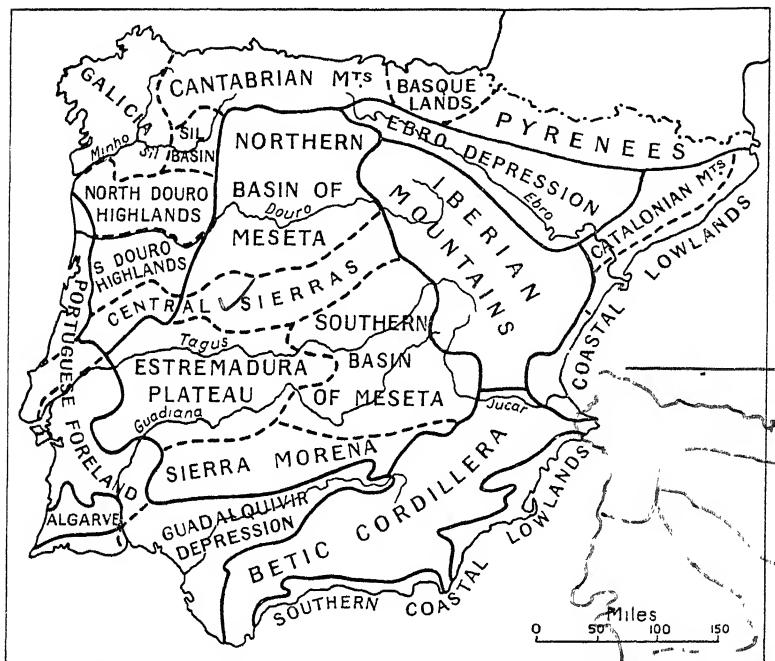


FIG. 29 —IBERIA: GEOGRAPHICAL REGIONS.

Cordillera where full development of *nappes* has taken place, and which may therefore be compared with the Alps and the Apennines as belonging to the Alpides, *i.e.* the young folded mountain zone of Eurasia.

Equally important is the fact that, at the end of Tertiary times, the whole of the old land-mass underwent epeirogenic, or vertical, elevation. This movement of re-elevation was responsible for many of the most characteristic minor features of the landscape at the present day. For instance, the rejuvenation of the river systems

consequent upon the epeirogenic movement led to the incising of the river valleys, and to the development of the innumerable gorges which are such a hindrance to communications. The interior saline lakes were also drained off and give the present plateau-basins of Old Castile-Leon and of New Castile, with their great stretches of level land. Moreover, the re-elevation was carried to such heights that gradients from the coast to the interior are everywhere severe, except along the central part of the Portuguese coast.

The Portuguese lowlands escaped great uplift owing to the



FIG. 30.—STEPPE AND IRRIGATED LANDS OF SPAIN.

development of a great north-south fault, which is traceable from the mouth of the Douro River almost as far as Cape St. Vincent.

Climate and Vegetation. A division of Iberia into two rainfall regions, pluviose and arid, is in some ways more helpful than that between a Mediterranean and a north-west European type of climate. The pluviose region, with over 600 mm. or 24 inches of rain, includes the western, northern, and north-eastern margins of the peninsula, *i.e.* most of Portugal, all Galicia, the Cantabrian and Basque region, the Pyrenees, and the Catalanian Mountains.

The area which may be said to have a north-west European type of climate is rather more restricted, since it includes only the northern margins of Spain and Portugal as far as the River Douro, and the western and central Pyrenees.

The Biscayan coast-lands and northern Portugal are marked off from the rest of the peninsula by having their rainfall well distributed throughout the year and no dry season. Summer temperatures are rather lower than in the Mediterranean sections, but the warm dampness of the lowland and valleys is more oppressive than the drier heat of the Mediterranean. Fortunately the large amount of mountainous country gives bracing air, and the region may be said to combine the advantages of both the north-west European and the Mediterranean types of climate from the point of view of plant life, as in the similar climate of the basin of Aquitaine in France. The rainfall is both heavy and constant enough for good cattle pasture and forest, and though the summers are not quite hot enough for the olive they are long enough for the vine, while the characteristic fruits of central and western Europe also flourish, and both maize and wheat can be grown. The diversity of produce is obviously great.

All the rest of the peninsula can be classified as Mediterranean in climate, though the modifications on the Meseta and in the Ebro basin are great. There is an abrupt change on the southern side of the Cantabrian Mountains from a humid climate with small daily ranges of temperature to an arid climate with marked contrasts between day and night temperatures. The Meseta generally has scanty rain, clear skies, hot dusty summer days, cold sunny winter days, and a marked drop of temperature at sunset at all seasons. The resultant vegetation is a sparse covering of *matorral* (cf. French *maquis*) and of dry tufted grasses, except in favoured areas, such as the better-watered valleys. The Central Sierras were originally forested, probably never very densely, but they have been largely denuded by man, and both the climate and cropping by sheep and goats are adverse to renewal. The northern portion of the Meseta is at a higher level than the southern portion, and consequently has lower temperatures, but there is no essential difference between the climate of the two sections. It is true that the olive will hardly grow north of the Central Sierras and can be grown in favoured spots on the Meseta south of them, but it is not widely grown on the Meseta at all. Drought-resisting plants such as wheat and barley will grow where the soil is sufficiently retentive of moisture, and there is a diversity of crops where the water-table is sufficiently high to be reached by the roots of plants, as in the valleys. Elsewhere the region is given up to pasturing sheep and goats. The Ebro

depression is similar, but has wide areas under irrigation, though some areas are too salt-impregnated for irrigation to be profitable. Irrigation of the Meseta is almost impossible even in the wide stretches which are covered with Tertiary deposits. In the first place, the rivers flow mainly in deeply incised valleys, sometimes hundreds of feet below the irrigable soil; secondly, many streams almost dry up in summer when water is most needed; thirdly, considerable areas, notably in New Castile, have very few streams at all, and, finally, large areas of New Castile have salt-impregnated soils.

The Catalanian Mountains resemble central Italy in climate and crops, but south of the Ebro the Mediterranean coastlands are drier than southern Italy, and especially in Murcia very little will grow without irrigation. The Andalusian depression is similar in climate to the Mediterranean coastlands, since it has high winter temperatures, though the rainfall is rather greater than on the Murcian coast. (See statistics below.)

The Portuguese lands south of the Douro have a heavier rainfall than the interior, greater atmospheric humidity, and higher winter temperatures. The climate favours a rather profuse development of the Mediterranean vegetation, and there is even enough rainfall for maize, which is not a typical Mediterranean plant owing to the large quantities of water it demands.

| Station | Latitude | Temperature in degrees Fahrenheit | | Annual Rainfall in inches |
|---------------|----------|-----------------------------------|------|---------------------------|
| | | Jan. | July | |
| Bilbao . . | 43° 20' | 46 | 70 | 46 } Biscayan type |
| Santiago . . | 42° 53' | 46 | 66 | 65 } |
| Lisbon . . | 38° 42' | 49 | 70 | 29 S. Portuguese type |
| Seville . . | 37° 23' | 52 | 85 | 19 } Andalusian and |
| Murcia . . | 37° 59' | 50 | 79 | 15 } Valencian type |
| Barcelona . . | 41° 23' | 47 | 74 | 21 Catalanian type |
| Burgos . . | 42° 20' | 35 | 64 | 22 } |
| Madrid . . | 40° 24' | 40 | 77 | 17 } Meseta type |
| Zaragoza . . | 41° 38' | 41 | 76 | 12 Ebro basin sub-type |

MEAN RAINFALL IN INCHES

| | Jan | Feb. | Mar. | Apr. | May | June | July | Aug. | Sept. | Oct. | Nov. | Dec. | Year |
|---------------|-----|------|------|------|-----|------|------|------|-------|------|------|------|------|
| Santiago . . | 7.8 | 6.4 | 6.7 | 5.3 | 5.2 | 2.5 | 2.0 | 2.4 | 5.2 | 6.7 | 7.3 | 7.6 | 65.1 |
| Lisbon . . | 3.7 | 3.3 | 3.8 | 2.8 | 2.1 | 0.5 | 0.2 | 0.3 | 1.3 | 3.0 | 3.7 | 4.0 | 28.7 |
| Seville . . | 2.1 | 1.9 | 2.5 | 1.9 | 1.7 | 0.6 | 0.0 | 0.2 | 0.7 | 1.9 | 2.4 | 2.7 | 18.6 |
| Murcia . . | 1.2 | 1.1 | 1.3 | 1.6 | 1.5 | 0.7 | 0.3 | 0.2 | 1.9 | 1.9 | 1.5 | 1.9 | 15.1 |
| Barcelona . . | 1.4 | 1.5 | 1.8 | 1.9 | 1.7 | 1.5 | 1.0 | 1.3 | 3.0 | 3.1 | 1.8 | 1.4 | 21.4 |
| Madrid . . | 1.3 | 1.3 | 1.6 | 1.6 | 1.7 | 1.3 | 0.4 | 0.5 | 1.5 | 1.8 | 2.0 | 1.6 | 16.6 |

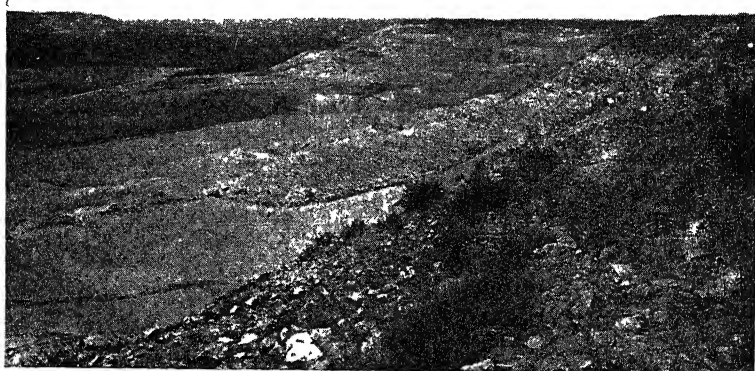
The Heart of the Peninsula, the Meseta. The term Meseta will here be used in its geographical sense to indicate the high tablelands of central Iberia, and not in the manner of many geologists who use the term to cover the whole of the so-called Archæan and Hercynian "block," regardless of relief.

The Central Sierras divide the Meseta into two sub-sections, that to the north lying in the old provinces of Old Castile (Span., Castilla la Vieja) and Leon, and that to the south in New Castile (Span., Castilla la Nueva) and Estremadura. These plateau basins, though mainly surrounded by higher and more rugged country, are themselves high, that of Old Castile and Leon averaging about 2,500 feet, and that of New Castile averaging about 2,200 feet. Considerable portions of these basins were once covered with saline lakes, and the floor of old rocks is therefore masked to a great extent by extensive deposits of Tertiary and later material; where these occur there are wide stretches of almost level plateau, particularly in the central part of Old Castile, in eastern Leon, and in the central part of New Castile, known as La Mancha. Elsewhere, however, the relief is rather rugged, especially in Estremadura, to the west of New Castile, where the ancient rocks have only intermittent patches of Tertiary material overlying them, and erosion, working on the different bands of old rock, has tended to produce a ribbed effect parallel to the strike, which is here mainly north-west to south-east. Further, the land round the rim of the basins is usually well dissected by rivers coming from the surrounding heights.

The Northern Meseta. This plateau basin, which stretches for some 110 miles from east to west and some 140 miles from north to south, is mainly covered by horizontal Tertiary deposits consisting of clays, marls, limestones, and sandstones. Wide, tawny expanses of monotonous, treeless plateau have developed, but the different types of rocks have offered an unequal resistance to erosion, and so have given rise to contrasting types of land utilisation. The softer rocks, such as the clays and marls, have weathered into extensive basins and plains, where, on very fertile red soils, cereals such as wheat and barley can be grown, as in the Tierra de Campos west of Palencia and the Tierra del Pan north of Zamora. The harder rocks, among which limestones predominate, form higher and drier tablelands, called *páramos*, often terminating in a *cuesta* or scarp overlooking the cereal lands. These limestone plateaus are devoid of water, and though at best they somewhat resemble the Apulian plateaus of Italy, usually they are much less productive and are used mainly for sheep pasture. Similarly unproductive are the great stretches of coarse gravels which surround the basin

and which are formed of recent detritus from the mountain rim. The Duero and its tributaries which drain the basin are mainly incised into the plateau, though they are accompanied, especially in their lower reaches, by alluvial terraces, which give rise to fertile soil, and in a few places may be irrigated.

It appears that the plateau may once have carried a good deal of forest cover and there are remnants of pine woods and of evergreen oak woods. There is very little true steppe except in the region round Valladolid, where the annual rainfall averages less than 12 inches. The limestone plateaus carry poor *matorral*. Bleak



[Photo: F. Hernandez Pacheco]

FIG. 31.—THE TIERRA DE CAMPOS, ON THE PROVINCIAL BOUNDARY BETWEEN VALLADOLID AND PALENCIA.

View taken in spring. *Páramos*, *cuesta*, and part of a basin are shown. Note the absence of trees and the flatness of the plateau.

and frosty in winter, hot, dusty, and very dry in summer, the northern Meseta offers a hard environment.

Population is scanty everywhere, varying from only 72 per square mile in the provinces of Palencia and Burgos to 76 per square mile in Zamora, 89 in Leon, and 112 in the Valladolid. Even the big towns are not large. Valladolid, the centre of the region, and once the capital of the kingdom of Castile, is now merely a "regional capital" with a population of only 136,000¹; Salamanca, once world-renowned for its university, has only 95,000, and the gap town of Burgos only 79,000.

¹ Population figures are estimates for 1947.

The Central Sierras rise gradually from the northern Meseta and drop abruptly on the southern side. These mountains, consisting largely of granite and crystalline schists, reach a height of 8,730 feet in the Sierra de Gredos, carry snow in winter, and were sufficiently high for the highest summits to carry glaciers and to be carved by cirques in the Quaternary Ice Age. As a rule, however, the pre-existing peneplain character is still sufficiently retained to give plateau-like and rounded forms. There are a few fragments of the old pine and oak forests remaining, but generally the mountains



[Photo: F. Hernandez Pacheco]

FIG. 32.—THE CABEZAS DE HIERRO (8,157 FT.), A GNEISSIC MASSIF IN THE SIERRA DE GUADARRAMA.

View taken in June from the foot of Peñalara. Note snow on mountains.

are bare apart from scrubby pasturage. Transhumant sheep and goats are driven up for the summer from the surrounding plateau, and human beings also take refuge in the cooler mountain air from the summer heat of Madrid.

In spite of their height the Central Sierras are not a great barrier to communications, as there are many passes, largely connected with the many geological faults.

The Southern Meseta. Here there are two contrasted regions, New Castile with Tertiary sediments, level relief and monotonous aspect,

and the more rugged and somewhat better-watered country to the west in Estremadura where the old rocks appear on the surface.

In New Castile the clays of the central portion, known as La Mancha, have an indeterminate drainage, and hold up water in lagoons which usually dry up in summer. It is interesting to note that the new cycle of erosion has scarcely reached La Mancha, and river valleys, where they exist, are shallow and not incised. The evaporation of these expanses of surface water has led to the development of widespread saline deposits in which only salt-loving vegetation flourishes. Since La Mancha is mainly surrounded by higher lands, its rainfall is scanty (its very name being Arabic



[Photo · F. Hernandez Pacheco

FIG. 33.—THE LLANURA, OR GREAT PLAIN, OF LA MANCHA.

View near Puebla de Almoradiel, province of Ciudad Real.

for “desert”), and steppe, mainly growing esparto grass in widely spaced tufts, is the prevailing vegetation. The salt steppes of La Mancha and those of the Caspian depression in Russia are striking examples of the “alkali” type of country which is little represented in Europe, but which is developed on so large a scale in western U.S.A., north Africa, central Australia, and central Asia. Sheep rearing is the historic industry, but since the water-table is near the surface and well-water easily obtainable the region is potentially more productive than the clay lands of Old Castile; not only cereals, but vines are widely grown, though the olive is restricted to sheltered localities. The population lives in large

agricultural villages, some of which are supported by the esparto industry. The La Sagra region, north of the Tagus, near Toledo, is rather similar country to La Mancha. The eastern margin of the central Meseta, known as La Alcarria, is, however, quite different. It stands at a higher level; its Tertiary limestones are much dissected by narrow valleys which are floored with clay, and are quite productive, though the limestone plateaus are remarkably arid and barren. La Alcarria is connected with the name of the Spanish hero Le Cid in his exploits against the Moors. The region is transitional to the Iberian Mountains.



[Photo · F. Hernandez Pacheco]

FIG. 34.—EVERGREEN OAKS AND PASTURE LAND IN THE VALLEY OF ALCUDIA, PROVINCE OF CIUDAD REAL.

View taken in May. Although much of New Castile is very poor land, the valleys are generally productive and have more trees than those of Old Castile.

Estremadura is a region of greater variety of relief, soils, and agriculture, and of somewhat greater rainfall. Its large surfaces of old, often impermeable rock, such as slates, quartzites, and granites, still carry a large number of rather stunted cork oaks, which were noted in classical times for supplying food to large herds of pigs. Much of the land presents the appearance of a heathy moorland, however, and only grazes sheep and goats, but there are favoured regions, such as the Tierra de Barros, south-east of Badajoz, where there is a considerable area covered with fertile Tertiary clays, and here cereals, vines, and olives are grown in abundance. In the

depression of Badajoz, on the Guadiana, with possibilities for irrigation, there is a region of even richer agriculture.

Population is as sparse in the southern Meseta as in Old Castile and Leon, and is similarly agglomerated into large villages with a curiously town-like appearance, or into small towns, but, with the exception of Madrid, large towns and cities are lacking.

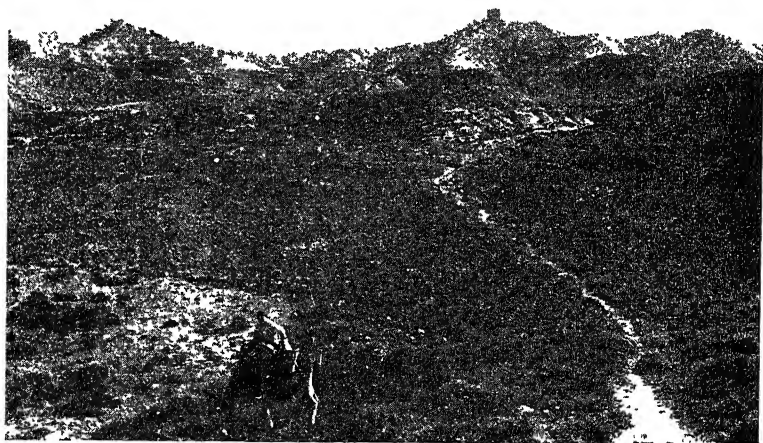
The position of Madrid has the advantage of being central and of being healthy, though other natural advantages are few, for it lies at a height of over 2,000 feet in the midst of a dry, sandy plateau, on a small river which dries up in summer. It was chosen as royal residence in 1561 in place of Toledo and as capital in place of Valladolid, and the system of roads, and afterwards that of railways, was centralised upon it. It is the seat of an administration which up to present times has been very highly centralised. It is also the chief centre in Spain of commerce, education, and art. With a population of 1,187,000 (in 1947) it was, however, until very recently, smaller in size than Barcelona, although the latter lacked the artificial advantages bestowed on Madrid.

Albacete (47,000), a gap town on the main railway line from Madrid to the Mediterranean coast, and Badajoz (46,000), in the fertile Guadiana valley, are the next largest centres of population in the southern Meseta. Toledo, high above the gorge of the Tagus, has dwindled to some 26,000 inhabitants.

The Sierra Morena rises very gradually from the central Meseta and is only a little above the level of the high plateau. On the south, however, it sinks abruptly by means of a great fault to the Guadalquivir depression. Although it has the character of a highly dissected plateau and is barren and scantily populated, yet it is particularly rich in minerals, especially copper and iron pyrites, which are mined to-day mainly in the Rio Tinto district; silver-lead, mined in the Linares district; and mercury, from the famous mines of Almaden. These deposits are largely associated with igneous intrusions. The small coal-fields, of Carboniferous age, south-west of Ciudad Real (Puertollano) and north-west of Córdoba (Belmez), have some importance in an area which otherwise is very deficient in fuel.

The Iberian Mountains. These folded ranges rise only gradually from the Meseta on the west but drop rapidly to the Ebro depression. They run for a distance of nearly 300 miles in a south-easterly direction from just south of Burgos nearly to the Mediterranean coast, where they overlook the plains of Valencia and Castellon. The ranges reach a height of 7,684 feet in the north where they are about 60 miles wide, and about 6,600 feet in the south, where, however, they average 100 miles in breadth. Their height, width, and

barren character makes them a formidable obstacle; in fact they formed the frontier between the old kingdoms of Castile and Aragon. There are two gaps, however, which allow movement between the Ebro depression and the Meseta. Between the Iberian Mountains and the Cantabrian Mountains is the transverse depression of Burgos filled with Tertiary material, while in the middle of the system is the gap along the River Jalon. The Teruel depression allows communication between the middle of the Ebro depression and Valencia. All three are followed by rail, the Jalon valley taking the main railway line between Madrid and Zaragoza. These



[Photo. F. Hernandez Pacheco

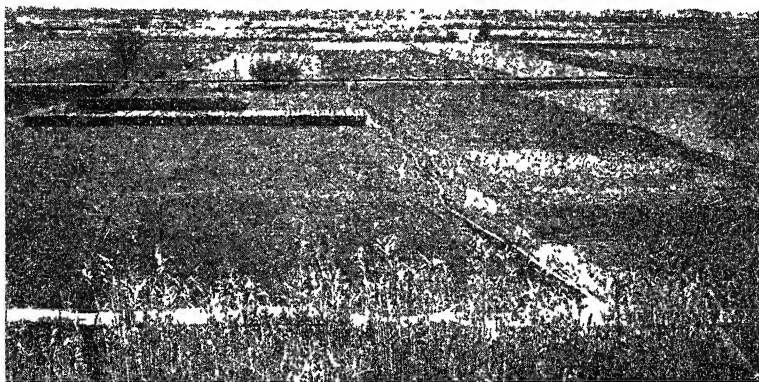
FIG 35 —STEPPE LANDS ON THE SIERRA DE ALCUBIERRE (MIOCENE FORMATION).
ON THE PROVINCIAL BORDER OF ZARAGOZA AND HUESCA.

Similar barren and much dissected hills are to be found on various formations around the depression of the Ebro. (The hills along the Mediterranean coastlands from Gibraltar to C. de la Nao, though higher, present a similar appearance.)

mountains have the melancholy distinction of having the lowest population densities of Spain, the Soria province having 41 per square mile, and Teruel province 38 per square mile.

The Ebro Depression. The climate and natural landscape of the Ebro depression resemble closely those of the steppes of the central Meseta, though the much lower elevation results in higher winter temperatures which enable the olive to flourish. It is blessed, however, with large supplies of water, owing to the nearness of the Pyrenees, so that large areas are under irrigation. Nowhere else in Spain is

a large arid region so close to mountains which have such a large volume of rain. It is not possible, however, to irrigate the whole of the Ebro depression, even if there were sufficient water available, for the region is not a continuous plain. The Tertiary deposits, consisting of practically horizontal layers of sandstones and marls, have been dissected by the rivers into a series of low, flat-topped plateaus, or where erosion has gone further, into *buttes* or *mesas*. Some land which would otherwise be suitable for irrigation is rendered useless owing to salt impregnation. The two main irrigated areas are, first, the lowlands along the Ebro below Tudela,



[Photo. F. Hernandez Pacheco]

FIG. 36.—THE ZARAGOZA HUERTA, NEAR THE JUNCTION OF THE EBRO AND GALLEGO

View taken in spring. The orderly appearance of this irrigated area recalls the similar lands in the Plain of Lombardy.

where irrigation water for 92,500 acres is derived from two main canals taken off from the Ebro itself, and secondly the lowlands round Lérida, where irrigation water is derived mainly from canals taken from the River Segre and River Esera, the latter a tributary of the River Cinca.

The irrigated lands round Lérida form the largest block of irrigation in the whole of the peninsula, amounting to some 400,000 acres. They result from the most recent of the great irrigation works, the Canal de Urgel dating from 1861, and the Canal de Aragon y Cataluña being finished in 1910. By means of a network of canals

the former steppes of the Llanos de Urgel have been transformed into highly productive land. A great variety of crops is grown, including autumn-sown crops, such as wheat, barley, oats, beans, lentils, potatoes, and spring-sown crops such as sugar-beet, maize, hemp, tomatoes, and pimento. Artificial meadows of alfalfa and clover have some importance. Tree crops, such as peaches, apricots, plums, and the drought-resisting olive, get an occasional watering, though vines can be grown with very little. Zaragoza (293,000), the old capital of Aragon, now stands in the midst of irrigated lands obtaining water from the River Gallego as well as from the Ebro. It has a good nodal position in regard to (a) the Jalon route through the Iberian Mountains to the Meseta, (b) the trans-Pyrenean route *via* Jaca, both followed by railways, and (c) the route following the River Ebro.

The Ebro depression nowhere abuts on the coast, but is cut off from it by the Catalanian Mountains, through which the Ebro breaks in a rugged defile.

The Catalanian Hill-and-Mountain Country. Apart from the plains round Lérida, which geographically belong to the region of the Ebro depression, Catalonia (Sp., Cataluña) is essentially a region of hills and valleys. The coast is backed by a littoral chain with rocky headlands, the only areas of coastal lowland being a small stretch along the Gulf of Rosas, the delta of the Ebro, and the Llobregat delta, on the east of which stands Barcelona. The littoral chain is succeeded landward by a tectonic depression forming an inner valley which is very productive, and which also contains a number of small manufacturing towns, such as Gerona (18,000), Sabadell (52,000), and Tarrasa and Reus (30,000). The depression rises on the north-west to an inner chain of hills and mountains parallel with the other zones. The region forms a great contrast not only to the central Meseta, but also to the Ebro depression, and in its climate, relief, vegetation, density of population, and active economic life closely resembles the northern parts of the Apennine peninsula. The mass of the region just comes within "pluviose" Spain, and the hillsides are covered with olives, vines, cork oaks, and similar Mediterranean vegetation. Irrigation is practised along the coast and in the lower valleys.

The region is predominantly agricultural, but also has an active commercial life, and possesses manufactures which, though not large compared with those of the industrial countries of Europe, are very important for Spain. The manufactures grew up on imported coal and iron and many of the raw materials are also imported. Large quantities of hydro-electricity (mainly from the Pyrenees) are now used, so that industrial development here has

had a similar history to that of the Italian industries, and the similar advantages of ample labour and a protected home market. Textiles (especially cotton), machinery, glass, and chemicals comprise the chief articles manufactured. These industries are centred mainly in and round Barcelona, and thus have also the advantage of ocean-borne transport for the bulky raw materials. Barcelona itself is the leading commercial and industrial city and the leading port of the whole of Spain, and with a population of 1,133,000 is the second largest city of the country.

Catalonia has a strongly pronounced regional consciousness, probably the most highly developed in Spain and certainly the most vocal. This consciousness is anti-Castilian and is based on profound differences of environment, language, and historical development between this bustling Mediterranean region and the aloof inland Castile.

The Irrigated Mediterranean Coastlands. From the Ebro delta south-westwards right round to the Straits of Gibraltar there extends a region of low rainfall and high temperature where oases of irrigation culture are backed and sometimes encircled by barren mountains. This long, narrow region shows some variation from north to south, but there is everywhere an essential contrast between the densely peopled, highly productive irrigation areas and the surrounding almost valueless and deserted mountains.

In the north, from the Ebro delta to Cape de la Nao in Valencia, the irrigated districts known as *vegas* and *huertas* (from Lat. *hortus*=a garden) are practically continuous along the coast, and the hills which back the region are not so barren as in the drier region of Murcia farther south. Whereas, however, the unirrigated land has a population density similar to that of the central Meseta (c. 70 per square mile) the huerta of Valencia has a density of over 2,000 per square mile. The narrow mountain valleys of this region of Tertiary rejuvenation facilitate the construction of dams just above the points where the rivers debouch on to the plains, and the rivers, which rise in the lofty Montes Universales, afford adequate supplies of water to irrigate the restricted area of these lowlands.

As in most irrigated areas there is an extraordinary diversity of produce, but the chief cash crops, largely exported to England, are oranges, grapes, and almonds. Small quantities of rice are also grown, but the old cane sugar and silkworm industries are moribund. Valencia (563,000), the third city of Spain, is the centre of the region.

In Alicante and Murcia, the mountains, which here belong to the eastern section of the Betic Cordillera, run parallel with and close to the coast, and out to sea at Cape de la Nao. The irrigation areas,

such as those round the towns of Lorca, Murcia, and Elche, are therefore mainly inland. The amount of water available is less than in Valencia, since the mountains are lower and more arid, and the supply is more difficult to control since the rainfall is both more seasonal and more torrential. The barrenness of the surrounding mountains amounts almost to desert conditions, and the steppes of New Castile are continued right across the intervening mountains to the gaunt ranges along the coast. The population figures of the numerous towns of considerable size bear witness to the productivity of the oases, *e.g.* Murcia (227,000), Cartagena (114,000), Alicante (116,000).

West of Cape de Gata, the lowland, and therefore the irrigable land, is very restricted, and there are only small huertas, *e.g.* round Almeria (102,000), Málaga (278,000). The mountains themselves are less desolate, having a more abundant rainfall—indeed, the western end of the Betic Cordillera may be said to form an outlying part of “pluviose” Spain—though still presenting an arid appearance to English eyes.

The Betic Cordillera. This region overlaps the previous one, but whereas in the above paragraphs it was treated merely as a background and a supplier of water to the irrigated coastal lands, here it will be treated as a structural entity.

The Cordillera stretches from the Cadiz coast, where it sinks beneath the waves of the Atlantic, to Cape de la Nao, where it disappears beneath the Mediterranean waters, only to reappear again at intervals in the Balearic Islands. Its length on the mainland is about 360 miles. On its northern side it sinks to the Guadalquivir depression in the west, but farther east it abuts directly on to the Meseta. It consists of three main east-west zones: first, a narrow Flysch band along the north; secondly, a broad band of Mesozoic sediments, chiefly limestone; and thirdly, a band of Palæozoic sediments and crystalline material which begins on the south coast west of Málaga and continues eastwards.

The narrow Flysch zone and the Mesozoic zone both have a fair rainfall on their western, *i.e.* Atlantic, extremities, and in the west carry remnants of former forest. They become much more barren as one goes eastwards and finally carry only steppe. In the Mesozoic zone, however, there are a number of tectonic depressions, and where these are at a sufficiently low level and not dissected by cañons they are able to draw on large supplies of water from the surrounding mountains, and in consequence are well cultivated and populated. The most important of these is the huerta of Granada, which has the advantage of lying between the Mesozoic and the crystalline zone and of obtaining large supplies of water

from the lofty, crystalline Sierra Nevada. Even the unirrigated lands of the Granada basin have enough water for the olive and for such cereals as wheat and barley. Granada (186,000), the last stronghold of the Moors in Spain, is world renowned both for the natural beauty of its site and for the magnificent buildings erected by the Moors.

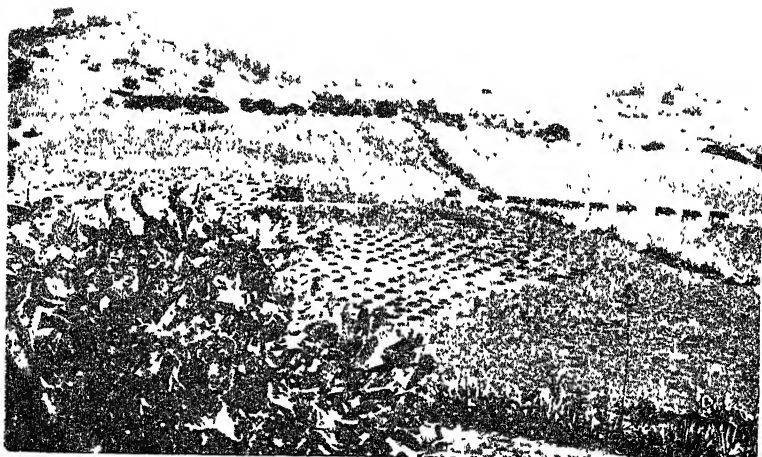
The Palæozoic zone is rather more productive than the Mesozoic, since the predominating crystalline schists of the former are more fertile and less permeable than the predominating limestones of the latter. Consequently, behind Málaga, the coastal mountains are well terraced and cultivated and the same is true of the valley sides in the interior. Farther eastwards, however, there is the same decrease in rainfall and therefore in productivity as in the Mesozoic zone, and vegetation degenerates into steppe in the eastern part of the province of Andalusia and, as already mentioned, in Murcia.

The highest range of the Betic Cordillera is the Sierra Nevada, which reaches a height of 11,421 feet in Mt. Mulhacen. It carries snow throughout the greater part of the year and a tiny patch or two usually remains throughout the summer. The ranges of the chain are separated from each other by depressions, often due to faulting, so that in spite of the length and breadth of the Cordillera it is fairly easily traversed and is moderately well served by railways.

The Guadalquivir Depression. This lowland, also known as the Andalusian or Betic depression, is a tectonic feature, some 200 miles long, about 100 miles wide at the seaward end, and some 50 miles wide at Seville. It is floored with Tertiary clays for the most part, but there are some residual limestones which form hills. Above Seville the lowland is lightly dissected, and the lowering of the base level of erosion has resulted in the formation of river terraces at various heights. Below Seville, however, the country is still marshy in the region known as Las Marismas, on the site of a former lake. Sand-dunes fringe the marshes on the seaward side. The Andalusian depression shares the high temperatures of the southern coasts, and in contrast to the Meseta possesses much good soil, but is not the rich and productive region it has often been fabled. On the contrary, it contains a good deal of unproductive steppe and its rainfall is usually only sufficient for olives and other drought-resisting crops such as wheat and barley, though in places it is adequate for vines. Moreover, there is no extensive irrigation system as in the Mediterranean coastlands or in the Ebro depression, though the small patches that are watered from the Guadalquivir yield excellent results. To make matters worse the area has been one of the strongholds of large estates (similar in size to those of the Meseta), with all the attendant evils

of the "latifundia" system. The most important products of the area are olive oil and wine, the wine of the Jerez region (sherry) being largely exported, while that from the foot of the Betic Cordillera (e.g. Montilla) is famous at home.

The largest town of the region is Seville (Span., Sevilla; 382,000), situated at the head of navigation for ocean-going steamers. Córdoba (177,000) is the only other town of any size in the interior, though there are many large villages. It stands at the point where the plain begins to widen out westward, and is a meeting-place for



[Photo: F. Hernandez Pacheco]

FIG. 37.—VIEW IN THE GUADALQUIVIR DEPRESSION.

Calcareous hills near Mairena del Alcor, province of Seville. Note the village and castle on the ridge, the string of bullocks in the middle distance and the prickly-pears and aloes in the foreground.

routes through the Sierra Morena and Betic Cordillera. There is no port at the mouth of the Guadalquivir, owing to the marshes and unstable sand dunes, but Cádiz (97,000) to the south has an excellent and historic harbour and is backed by the best watered region of the plain. Huelva (65,000), on the northern edge of the plain, is the port for the Rio Tinto copper and pyrites mines of the Sierra Morena edge.

The Northern Coastlands of Spain. These northern lands all possess a climate with abundant rain and equable temperatures, but show considerable differences in their relief and in their inhabitants. Three regions may be distinguished, the Basque lands on the east,

the Cantabrian Mountains of the Asturias in the middle, and Galicia in the west.

The Basque hill country is composed of sandstones and limestones of Mesozoic, mainly Cretaceous, age, folded probably at the same time as the Pyrenees, and continuing in almost the same direction. It has three main lines of mountains running east-west and separated from each other by parallel depressions, but the mountains are highly dissected into small blocks by northward and southward flowing rivers, so that in spite of its considerable heights (c. 2,000–4,000 feet and more) the region offers a network of routes, and it has much easier lines of movement than either the Pyrenees to the east or the Cantabrian Mountains to the west. The northern side is rainy, well cultivated, and thickly peopled, whereas the southern side partakes of the aridity of the Ebro depression. The original vegetation consisted of forest (beech, oak, sweet chestnut, etc.), of which considerable fragments remain; cultivation is mainly concerned with fodder crops, meadow grasses, maize, and orchards of temperate fruits, such as apples. As in all the northern coastlands, small holdings and a disseminated population are the rule, in contrast to the large holdings and aggregated dwellings of the mass of Spain. The rich Jurassic iron deposits between Bilbao and Santander have led to the development of an iron industry in Bilbao (220,000), though the bulk of the ore is exported to the British Isles, the return cargo being Welsh coal in normal times. The city of Bilbao, eight miles up the drowned estuary of the Nervion, is also an important banking and commercial centre, with an outpost at Portugalete. The people of this region, who share with the Catalonians a reputation for energy and enterprise, differ in many ways from the population of the rest of Spain. In particular their language marks them off as a people apart, since it does not belong to the Indo-European group, but is apparently descended from a very ancient group of languages, of which it forms the sole modern representative. Its use is diminishing in favour of Castilian, especially in the big towns of the region. The Basque hill country forms the northern gateway from Spain into France.

The same type of country is continued westward into Old Castile, which here reaches the north coast, the iron-exporting and manufacturing town of Santander (114,000), on another drowned estuary, being also the chief port of the northern Meseta, and one of the chief ports of Madrid, though it is 320 miles from the capital.

The Cantabrian Mountains of the Asturias rise to much greater heights, the Peñas de Europa reaching 8,740 feet. The high mountains were glaciated during the Great Ice Age and show "lofty summits lost in mist, toilsome passes, deep narrow valleys,

gorges and ravines" (Dantin-Cereceda). It was behind these ranges, *i.e.* to the north of them, that the Christian resistance was first organised against the Moors for the reconquest of Spain. The folded Cantabrian Mountains extend westward for some 150 miles to the border of Galicia. They form a complex system both in relief and structure, with summit levels reaching between 6,000 and 7,000 feet as a general rule. At the western end, the mountains turn south-westward and divide to enclose the basin of the upper Sil. Generally speaking, the rocks become progressively older from east to west, the eastern portion consisting mainly of Mesozoic limestone with a high proportion of dolomite, the middle portion of late Palæozoic limestones with some slates, and the western portion of still older rocks, mainly slates and quartzites. The mountains offer a formidable obstacle owing to the absence of low passes, few being under 4,000 feet, and this is to be associated with the prevalence of limestone, and the lack of normal drainage due to the development of Karstic conditions. There is only one main route across, *via* the Pajares pass, and the rail crossing involves 27 miles of railway line and 60 tunnels to traverse a distance of only seven miles as the crow flies. The rail route from Madrid to Santander is not quite so difficult, but is really at the eastern end of the high Cantabrians. The mountains offer only a poor living to a scanty population, for although some forest remains, for the most part they carry only sheep pasture, like similar Karstic regions elsewhere in Europe, *e.g.* the Abruzzi, the Dinaric Alps.

On the north the Cantabrian Mountains drop down to an east-west rift valley filled with deposits of the Cretaceous period, beneath which Palæozoic coal measures are preserved. This depression broadens out round Oviedo (88,000), and is separated from the narrow coastal platform by a belt of hilly country. "Here is the Asturias of the stories, the Asturias of light, free air, moderation, and balance. In the mild, humid, uniform climate Central European vegetation flourishes side by side with the Mediterranean fig, the Asiatic orange and lemon; the rosy apple blossom decks the garden walls" (Dantin-Cereceda).

The region is also rich in minerals, the chief coalfield of Spain lying in the rift valley near Oviedo, though the annual output is only about five million tons. Considerable iron-ore deposits in the neighbourhood, and zinc towards the east have assisted the development of metallurgical and chemical industries at Oviedo. Gijón (104,000) is the port for this area.

The Sil basin forms a productive and thickly populated area within a framework of the lofty Cantabrian ranges. Although at

a height of some 1,500 feet, it is rich farming country, owing to the alluvium with which it is floored.

Galicja is a dissected peneplain composed mainly of granite, slates, and crystalline schists. It has many features in common with the other two regions of Europe that end in a "Finisterre," namely, the south-western peninsula of England, and Brittany. Not only are all three dissected peneplains, but they all have a *ria* coast with a fishing industry, an equable rainy climate, and an active dairying industry. All are fairly densely populated in spite of considerable areas of infertile granite, and all have suffered commercially from their peripheral position. The central depression of the Miño valley is more thickly peopled than the rest of the interior, but population is strongly attracted to the coast. As in Brittany, the sardine fishery is important, and as in the corresponding regions of England and France, there is an important naval station on a *ria*, here Ferrol (68,000). Vigo (118,000) and Corunna (Span., Coruña; 130,000) are ports of call for liners on the South American route.

The Pyrenees. The Pyrenees stretch for about 260 miles between the Mediterranean and the Bay of Biscay and attain a maximum width of about eighty miles. Like the Alps they contain an interior zone of hard crystalline rocks, such as granites, gneisses, and crystalline schists which weather slowly, and outer bands of little altered sedimentary rocks, generally of Mesozoic and Tertiary age, in which limestones predominate. The higher peaks and the watershed lie nearer the northern than the southern side, so the northern or French slope is steep and narrow, but on the Spanish side the descent is more gradual. The Pic d'Aneto (11,169 feet) in the Maladetta group is the highest summit of the chain, and the central Pyrenees between the Col de la Perche and the Pic d'Anie maintain a great average height, never falling below 5,000 feet.

Unlike the Alps, the Pyrenees have no glaciers of any size, only one or two little plateau glaciers on the northern side of the highest peaks, but they were abundantly glaciated during the Ice Age and bear all the marks of ice-work in the sharp arêtes, the U-shaped valleys, cirques, rock basins, and so on.

The western Pyrenees stretch from the Bay of Biscay to the Pic d'Anie, a distance of some fifty miles. They present considerable differences from the central Pyrenees, since the middle crystalline zone is here very narrow, and its place is largely taken by Permian-Triassic sandstones. South of this belt lies a band of early Tertiary material consisting of marls and conglomerates, generally easily eroded and forming lower ground. In this zone on the River Argá stands Pamplona (78,000), the capital of Navarra. The

whole region has rounded forms, instead of Alpine peaks, and is fairly easily crossed, the best known pass being that of Roncesvalles (3,452 feet), which carries a motor road. The only railway skirts the mountains by following the coast. The rainfall is considerable even on the Spanish side, and some forest remains, though it has been much cleared to form arable land, as well as pasture. On the south-west the Pyrenees merge into the Basque hill country.

The central Pyrenees extend for a distance of some 160 miles. The broad central zone of crystalline schists of Palæozoic age, with numerous masses of granite, gives rise to impressive mountain scenery of steep-sided mountain blocks, with occasional towering crags, though true peaks are not very frequent. Summit levels are generally over 10,000 feet and there are few passes under 7,000 feet. This high backbone falls on the south to a zone of rugged but not quite so lofty country, formed of Mesozoic rocks, containing much limestone. This is followed by a zone of early Tertiary rocks, including marls and conglomerates, which form a belt of lower land. Farther south, overlooking the Ebro basin, a second zone of Mesozoic rocks forms the mountainous country of the sub-Pyrenean ridges, with summits of 4,000 to 6,000 feet. The rivers coming from the high central ranges break through all three zones, but often have longitudinal tributaries coming in from the Tertiary zone. These longitudinal depressions are shorter, less deep, and less broad than those in the Alps and offer less suitable sites for human habitation. Occasionally, however, they broaden out, as along the upper reaches of the Aragon River, in whose valley was formed the nucleus of the kingdom of the same name. On emerging from the Tertiary depression the rivers break through the sub-Pyrenean ridges in deep gorges. The central Pyrenees form a climatic divide, the French side having a heavy rainfall distributed throughout the year, while the Spanish side is dry and therefore much less productive. There is much steppe in the Tertiary depression and on the sub-Pyrenean ridges. Little cultivation is carried on and the scanty population derives a livelihood mainly from sheep and goat-rearing. A beginning has been made, however, with the development of hydro-electricity. Two trans-Pyrenean railway lines have been recently constructed in the central section, a western one, opened in 1928, following the old Somport pass and connecting Zaragoza with Pau, and an eastern one *via* the Puymorens tunnel, connecting Barcelona with Toulouse.

The eastern Pyrenees stretch eastwards from the upper Segre River and the Col de la Perche for some sixty miles, and attain heights of over 9,000 feet in Puigmal and Canigou, the latter in France.

They are, however, very attenuated near the coast, where they break down except for the narrow Mts. Albères, which separate the tectonic basin of Roussillon on the French side from the similar but smaller basin of Ampurdan on the Spanish side. A railway follows the coast route.

Although less than half as long as the Alps, only about half as broad, and less high, the Pyrenees have always been considered more of an obstacle. The physical difficulties, however, have often been exaggerated, and the real reason for the lack of early roads and railways is to be found in the position of the chain. In the first place it does not lie athwart any great world route, as do the Alps, and secondly the traffic that existed could circumvent the chain either by the coast routes at either end or by the sea routes. Once the demand for routes arose in modern times with the coming of the tourist "industry," hundreds of miles of roads suitable for motoring have been made, particularly on the French side, where the tourist industry is better organised, and, as already mentioned, two railways now cross the chain.

Spain. Economic Summary. In spite of its excellent position, its early entry into the civilised world, and its great trans-oceanic conquests in early modern times, Spain to-day is a backward country. One should not expect a dense population in this arid land, though the population density of 148 per square mile is rather surprisingly low. Nor should one expect great industrial development considering the small deposits of coal and the expense of working the rather difficult seams, but there are considerable amounts of iron-ore and water-power, and in comparison, say, with Italy little has been made of these opportunities. The staple industry, that of agriculture, is usually considered to be rather backward, except in the irrigated areas and the pluviose north, but generally speaking it does not suffer so much from primitive methods of farming as from out-of-date practices associated with land tenure; these range from *latifundia*, large farms owned in many instances by absentee landlords, to onerous feudal dues in Galicia, and lack of security for the tenant everywhere. Many of the farming methods which were stigmatised as primitive in the early years of the present century, have been found in recent years to be the only methods practicable under the very arid climatic conditions; for instance, the dry-farming technique of bare fallowing and repeated ploughing, wasteful though it seems of land and labour, is absolutely necessary in Old Castile. Spanish agronomists have calculated that only about 10 per cent. of Spain is first class agricultural land, another 10 per cent. is completely rocky and useless, 35 per cent. is practically unproductive owing to high altitude,

great dryness, or poverty of soil, and the remaining 45 per cent. is of medium productivity.

Agriculture is the chief occupation of the country, about 32 per cent. of the total area being under cultivation. The rest of the area is mainly either poor grazing land or totally barren, the area under forest being very small. The agricultural exports come principally from the irrigated lands of southern Spain, and consist chiefly of oranges, wine, grapes, olive oil, almonds, and other nuts. Cork and esparto grass, both natural products, are exported to some extent. Curiously enough, the widespread sheep industry plays little part in the exports.

The large amount of high plateau, the paucity of coastal plains, the absence of navigable rivers, and the steepness of the gradients inland from the coast are all unfavourable to the economic development of the country. Yet when all excuses are made, the fact remains that Spain comes off poorly when comparisons are made with other countries of Europe in almost all aspects of material development, and even with comparisons of the country's own material, cultural, and educational levels in the hey-day of its prosperity. About 50 per cent. of the population is illiterate, a percentage only matched in Europe by those countries which have but recently freed themselves from the Turks.

Many explanations have been put forward to account for the modern backwardness of Spain. The long wars against the Moors, who were of Moslem religion and of Arab and Berber origin, are said to account for the fanaticism developed in Spain, and this fanaticism led in turn to the expulsion not only of the Moors but also of the Jews, who formed the principal commercial class. The discovery of America and the exploitation of the minerals of the New World led to loss of man power and to the neglect of the homeland. The domination of the whole country, and between 1580 and 1640 of the whole peninsula, by the central Meseta was also adverse to progress, since militant Castile, the chief champion against the Moors and therefore the most fanatical, was a poor country agriculturally and little interested in the furtherance of agriculture apart from sheep-rearing. Also Castile was remote from the sea and from other nations and little interested in commerce. The excellent central position of Castile and its good military organisation enabled it to dominate the more advanced parts of the country, such as Catalonia and the Basque provinces, and the marked differences between the various outlying regions of Spain led to a strong development of regionalism, which, though it was often anti-Castilian, also made it difficult for these regions to unite among themselves.

The early part of the twentieth century saw the stirrings of new life in Spain and there was undoubtedly progress, particularly during and after the war of 1914-18, when Spain's neutrality was both profitable at the time and left her without the heavy debts and loss of man-power incurred by the belligerent states of Europe. The Civil War of the 1930's, however, probably more than wiped out all the gains that had been made since 1914.

PORTUGAL

Portugal is in many ways more favoured by nature than Spain. Although the main structural lines of the western part of the Meseta are continued into Portugal, yet the highlands and uplands are generally at a lower altitude and they slope down to coastal lowlands threaded by navigable rivers. Since the country has also the advantage of being to windward of the land-mass and of having an equable maritime climate with adequate supplies of rain, it is potentially more productive than Spain and its population density is higher, being 239 per square mile in 1950, having risen from 186 per square mile in 1930.

Portugal's Seaward Outlook. Portugal's geographical outlook is seaward and this gives the country an individuality quite different from that of Spain. Portugal was held together by the attractive force of the sea, and it maintained its independence by means of the English alliance, which dates from the fourteenth century. Separated from Spain by a belt of barren, scantily populated country, Portugal extends inland only to the head of navigation of the Rivers Douro¹ and Tagus. Along the Hispano-Portuguese frontier the Douro and Tagus run in stupendous gorges, and there is not, and never has been, a road along the Tagus connecting Lisbon and Madrid, though this seems the obvious route on the map. Portugal takes its name from the old Roman port on the Douro of Portus Cale (the modern Oporto), the first capital of the country. The capital was moved to a more southerly port, Coimbra on the River Mondego, and finally to the best port of all, Lisbon on the River Tagus, when the latter town was recovered from the Moors in the twelfth century. The association of the capital with navigable waterways was of first-class importance in the development of the country, and this small land of 35,000 square miles (about the size of Ireland) still has a colonial empire of c. 800,000 square miles, in addition to the "Adjacent Islands" of Madeira and the Azores which cover about 1,200 square miles. Another aspect of the oceanic outlook, the English alliance, was foreshadowed as early as 1217, when an English contingent helped the Portuguese to drive the Moors

¹Duero in Spain.

southward across the Sado River, but the historic treaty came in 1386, after the Portuguese had defeated the Spaniards with the aid of English bowmen. This treaty was accompanied by the marriage of Philippa of Lancaster (daughter of John of Gaunt) with the ruler of Portugal, and their more famous son became known to history as that patron of explorers, Prince Henry the Navigator.

Natural Regions. Both in structure and relief Portugal is a complex country, but it consists essentially of three or four major elements: (i) the coastal lowlands, which broaden southwards from the mouth of the Minho, to (ii) the Algarve Highlands in the south of the country, (iii) the dissected highlands of the north-east, which may be further subdivided into (a) the Douro plateau, and (b) the Serra da Estrella. Some authorities would add a fourth element, the Alemtejo plateau, along the Hispano-Portuguese frontier, north-west of Badajoz.

There is, however, a fundamental climatic contrast between the provinces north of the Tagus and those to the south, which is reflected in almost every aspect of the environment. Portugal extends through latitudes which would naturally tend to give her an Atlantic climate in the north and a Mediterranean climate in the south; this contrast is emphasised by the mountain character of much of the land north of the Tagus, with the consequence that high relief provokes even heavier rainfall and a good deal of winter snow, whereas the south consists mainly of lowlands with much level plain, so that the natural tendency to summer drought and a smaller total precipitation finds nothing but the low Algarve Highlands to counteract it. In consequence the north is a land of profuse vegetational growth, both hills and valleys being originally covered with deciduous forests, while in the south only

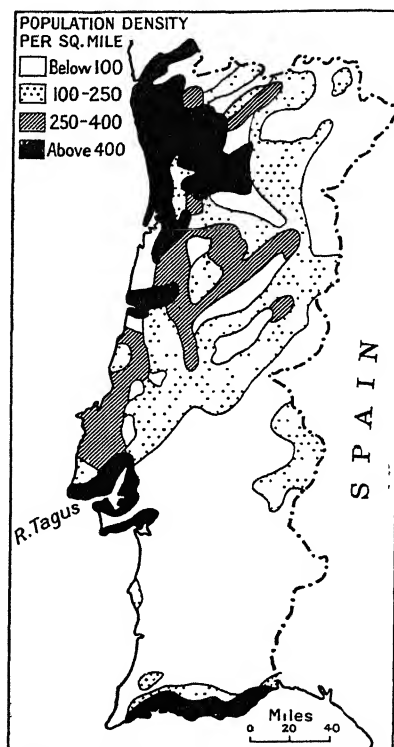


FIG. 38.—PORTUGAL: DISTRIBUTION OF POPULATION.

drought-resistant vegetation will flourish. The crops also show a contrast, maize and rye being staple cereals of the north, and wheat and barley of the south. The distinction between north and south is further emphasised by the fact that the country north of the Tagus is *old* Portugal, while that to the south is *new* Portugal, and in contrast to a high density of population in the north, living on small holdings and in small villages or isolated farms, one finds a scanty population in the south, living on large holdings, and mainly in large nucleated villages (see Fig. 38).

Lands North of the Tagus. *The Douro Highlands or Plateaus.* These are only plateaus in the sense that the Highlands of Scotland are plateaus. An erstwhile peneplain has undergone epeirogenic elevation, and this together with heavy rainfall has resulted in a highly dissected surface, with complex ridges separated by deep valleys. The rocks, which are mainly crystalline, and include granites, gneiss, quartzites, crystalline schists, and slates, comprise the roots of an old massif, and represent a continuation, geologically speaking, of similar lands across the frontier in Galicia. Physiographically, the Douro Highlands are more rugged, and have summit levels at greater heights than those of the massif in Galicia.

The Douro Highlands carry a good deal of forest, except in Traz-os-Montes near the Spanish frontier and in the highest parts of the serras. Gorse, heather, ferns, and grass grow in clearings or on deforested land. There is a very considerable contrast between the eastern and western parts of the Highlands, which is reflected in the population map. The greater part of Traz-os-Montes and northern Beira consists of barren, scantily-populated highlands, where rye and potatoes are the characteristic crops. The eastern part of the region is difficult of access, but the broad valleys of the Rivers Sabor and Tuella lead down to the famous port wine country along the Douro, where the terraced slopes are intensively cultivated. The province of Minho, to the west of Traz-os-Montes, slopes down to the sea from heights of over 4,000 feet, and though still a land where granite outcrops on the ridges, yet its valleys and lower slopes are intensively cultivated. There is really no coastal plain here, but merely river valleys separated by rocky, granitic headlands. The population attains a density of more than 400 per square mile; maize, the vine, fodder crops are cultivated, and cattle reared, while the sardine fisheries are important along the coast.

The Serra da Estrella. This highland, which consists of two main ridges, continues the line of the central sierras of Spain and attains heights of over 6,000 feet. In spite of the snowy winters, the vegetation contains numerous Mediterranean elements, and though some

forest remains, *cistus matorral* and heaths are the prevailing vegetation. The very scanty population is chiefly engaged in sheep-rearing.

The Portuguese Coastal Foreland North of the Tagus. As already mentioned, there are only discontinuous lowlands north of the River Douro. South of that river, the lowlands are marked off from the highlands by a great fault which runs from Oporto to Abrantes on the Tagus, though there is an extension of the lowlands east of this line, up the valley of the Mondego. Even this "Foreland" west of the great fault, however, was not immune from the earth swells connected with the Alpides movements, and the line of the Serra da Estrella is continued at a lower level and with younger rocks (mainly Mesozoic limestones) towards the southwest, in hills which run parallel to the Tagus and terminate in C. da Roca. Between these hills and the mouth of the Douro there is a triangular lowland, mainly below 600 feet, where broad, shallow valleys alternate with low limestone hills and plateaus. It is fronted on the seaward side by sand-dunes, behind which are lagoons and large expanses of sandy-flats, so that the region resembles the Landes of France, and the dunes are similarly clad with pine forests, which are cut over for pit props and tapped for turpentine. Some of the swampy land near the coast has been drained for rice fields, but the characteristic crops of the greater part of the Foreland are maize, beans, vines, and fruit trees. The central or coastal hills of the Tagus peninsula, which shut in the lowland on the south, seldom rise above 2,000 feet, and usually consist of tablelands at heights of 750–1,500 feet where Karstic conditions have developed. The sides of the hills, however, are devoted to vineyards, about 40 per cent. of all the wine produced in Portugal coming from the Tagus peninsula. It was across this peninsula, to the north-east of Lisbon, that Wellington constructed his famous defensive lines of Torres Vedras.

Towns. The three chief towns of Portugal are all situated north of the Tagus. Oporto (263,000),¹ some four miles from the mouth of the Douro, is the chief city of northern Portugal, and in addition to handling the port wine trade has considerable textile industries. It has the advantage of Portugal's chief coalfield in the vicinity, but the annual output amounts only to some half-million tons, and in recent years additional power has been obtained from hydro-electrical works near the Spanish frontier. Owing to the insufficient depth of water at Oporto, and the difficulty of deepening the river or of building docks in the narrow, rocky valley, an outport has been made at Leixões. Oporto may be looked upon as the regional capital of northern Portugal.

¹ Population figures from the 1940 Census.

Coimbra (35,000) with its old university, founded in the thirteenth century, remains a small regional centre, many of its students having been drawn off to the new twentieth century universities at Oporto and Lisbon.

Lisbon (709,000) concentrates the greater part of both the civic life and the overseas trade of Portugal. Situated midway between the rugged, rainy north of the country and the spacious plains of the droughty south, it forms a convenient administrative centre for both, though there is no bridge across the river for forty miles from its mouth. The famous bottle-necked estuary of the Tagus, which is only about a mile across between the hilly Tagus and Setubal peninsulas, opens out opposite Lisbon into a vast expanse of water, some twelve miles long with a maximum width of seven miles, which forms one of the world's best harbours. Since the deep channel lies along the high northern shore, while the southern side is edged by swampy alluvium, the choice of site was obvious.

In the hey-day of the Portuguese overseas expansion Lisbon was a great slave market and a trading place of great international importance.

Lands South of the Tagus. South of the alluvial flats of the lower Tagus, the land rises to rolling plains which stretch southwards for some ninety miles, but have a breadth of little more than thirty miles. To west, east and south they rise to plateaus, which are comparatively low on the seaward side, rise gently on the east to over 1,200 feet in Alemtejo, and to 1,885 feet on the south in the Highlands of Algarve. East of the Alemtejo plateau the land sinks again to the Guadiana valley. The Setubal peninsula and the province of Algarve stand somewhat apart and are best treated separately.

The Plains and Low Plateaus of South Portugal. These lands lie mainly in the drainage areas of the Sado and Sorraia Rivers, which carry little water, especially in summer. They are floored with almost undisturbed sandstones and clays, and owing to the summer drought and to lack of facilities for irrigation, they are devoted to the extensive cultivation of cereals, chiefly of wheat. The climate is too dry for maize. The cork-oaks for which the region is famous often grow as isolated trees in the midst of the wheat fields, though they grow in closer formations on the plateaus, particularly on the western Serra de Grandola. The olive is the only other tree grown to any considerable extent, though there are fruit trees in favourable localities, e.g. the plums of Elvas in the Guadiana valley. The higher and less productive parts of the plateaus are covered by cistus *matorral*, alternating with various heaths and other plants, on which sheep manage to pick up a living.

The coastal strip is dune-edged and unproductive except where it is broken by a volcanic outcrop at Cape Sines, and along the lower Sado River, where former swamps have been drained for rice cultivation.

The population is generally less than a hundred to the square mile.

The Setubal Peninsula. The limestone Setubal peninsula faces the similar Tagus peninsula across the estuary. Although its centre is unproductive and covered with *matorral*, it has a fertile and densely peopled strip on the north along the Tagus estuary, and another on the south, margining the sea and the Sado estuary. Setubal (35,000), at the mouth of the Sado, is the largest town south of the Tagus; it is a centre of the sardine fishery, and exports locally produced oranges and wine, together with large quantities of cork from the interior.

Algarve. Two strongly contrasted environments are found in this province. Along the southward-facing coast is a fertile, densely populated strip, which is backed by the unproductive, scantily peopled Algarve Mountains. The latter, of Hercynian age, are mainly composed of Carboniferous slates, and continue the line of the Sierra Morena, though they are separated from the latter by the Guadiana valley. They are covered with dense *matorral*, though there are some trees in places.

The Algarve coastlands still have a Moorish appearance and resemble the southern coastlands of Spain, with their white, often flat-roofed houses set among palm trees, pomegranates, figs, oranges, and almonds. Fruit is produced in abundance, but the salt-pans and tunny-fishing also have some importance.

Economic Summary. During recent years Portugal has roused itself from the economic lethargy into which it had fallen, and there have been considerable efforts to increase the area under irrigation and to improve farming generally. The drainage of many marshes near the coast has been followed by a large increase in the rice crop, but the staple commodities of export remain the three historic ones, namely, wine, sardines, and cork.

Portugal holds fourth place in Europe for the acreage under vines, though contrary to general belief, only 8 per cent. of the acreage produces port wine, in spite of this type being the most valuable and figuring largely in the export list. The historic Portuguese trade in wine with England was greatly fostered by the Methuen Treaty of 1703, which gave preferential treatment for the import of Portuguese wines into England in exchange for preferential treatment for the import of English textiles into Portugal. Portugal is now almost self-sufficing in textiles, and even has a small export. The textile industry employs about 50,000 people, nearly as many

as the fishing industry (c. 55,000). Although cork figures only third on the export list, yet the output amounts to half the world's supplies.

Portugal contains many minerals, though only in small quantities. The chief mineral, after coal, is wolfram, of which Portugal possesses the chief European supplies at Panasqueira in the province of Beira Baixa, in the south Douro plateau.

The imports consist chiefly of raw cotton, coal, dried fish (chiefly cod), colonial produce (e.g. sugar, coffee), and petroleum.

REFERENCES

There are no text-books available in English dealing solely with Spain or Portugal, but M. I. Newbigin's *Southern Europe* (London, 2nd ed., 1948) contains sections on these countries, and more detailed accounts are given in Tome VII (Part 1) of the Géographie Universelle series, *La Méditerranée-Généralités, Espagne, Portugal*, by M. Sorre (Paris, 1934).

L. Martin Echeverria's *Geografía de España*, in three small volumes (Barcelona, 1928), is very useful and is well illustrated with maps, photographs, and diagrams. Three articles on "The Natural Regions of Spain," by J. Dantun-Cereceda, appeared in *The Geographical Teacher* (1922 and 1923); they are abstracts from *Regiones Naturales de España* (2 vols., Madrid, 1922) by the same author. See also "Galicia, Spain," by E. H. G. Dobby, in *The Geographical Review*, Oct., 1936.

On structure R. Douvillé's "La péninsule ibérique" (in *Handbuch der regionalen Geologie*, III, 3, Heidelberg, 1911) is useful, but is somewhat out of date. A most interesting paper on the structure is R. Staub's "Gedanken zur Tektonik Spaniens" (in *Vierteljahrschrift d. Naturforschenden-Gesell.*, Zürich, vol. 71, 1926).

J. Brunhes' *L'Irrigation dans la Péninsule Ibérique et dans l'Afrique du Nord* (Paris, 1902) gives a very full account but is out of date for many areas.

For Portugal, the standard work is H. Lautensach's *Portugal auf Grund eigener Reisen und der Literatur*, in *Petermann's Mitteilungen*, in two parts, (1) *Das Land als Ganzes* (1932), and (2) *Die Portugiesischen Landschaften* (1937).

Other interesting recent papers on Portugal include "La Division provinciale de l'État Nouveau Portugais," by A. de Amorim Girão; "L'habitat rural au Portugal," by O. Ribeiro, both in *Boletim de Soc. de Geografia de Lisboa*, 1938; and "Le site et la croissance de Lisbonne," by O. Ribeiro, in *Bulletin de l'Association de Géographes Français*, 1938; and "Economic Geography of the Port Wine Region," by E. H. G. Dobby, in *Economic Geography*, July, 1936.

On Spain, an authoritative article entitled "Wheat-growing in Old Castille," by R. Aitkin, in *Journ. Tyneside Geog. Soc.*, Oct., 1937, and "Water-power in Spain," by Margaret R. Shackleton, in *Geography*, vol. 14, 1927, may be consulted.

CHAPTER VIII

THE GREEK PENINSULA AND ISLANDS

THE total area of Greece amounts to only 51,000 square miles, but this small area of land is spread over a large range of latitude and longitude owing to the manner in which it is interpenetrated and surrounded by the sea. From the northern boundary in Macedonia (about $41\frac{1}{2}^{\circ}$ N.) to the southern coasts of Crete (about 35° N.) is a distance of some 450 miles, or as far as from Dover to Inverness, while from the west coast of Corfu (c. $19\frac{1}{2}^{\circ}$ E.) to the east coast of Samos (c. 27° E.) is an almost equal distance.

Growth of the Modern State. The modern Greek state dates from the Wars of Liberation of 1821–29, when a small southern portion of the present state won its freedom from the Turks. The parts freed at that time were the Morea, Attica, and the adjoining lands south of a line from the mouth of the Aspropotamo River to that of the Spercheios River, together with the islands of Eubœa, the Cyclades, and the Northern Sporades. These had constituted the major part of the European Greek lands of classical antiquity, but there were many people of Greek speech further north in Thessaly, Macedonia, and Thrace, as well as along the coast of Asia Minor.

Greece fell to the Turks in the fifteenth century at the time of the overthrow of the Byzantine Empire, but for the previous two centuries it had been under the rule of the so-called Franks, who were adventurers of French origin, and of the Venetians, who together had turned the Fourth Crusade against Byzantium in 1204. The Frankish feudal lords, who had divided up the country amongst themselves, so impoverished the land by incessant warfare against each other that it could offer no resistance to the Turkish conquerors.

There are few Turks remaining in Greece at the present time, but from the remotest times there seems to have been an intermittent pressure of population from the north, so that the population of modern Greece is racially more mixed than that of ancient Greece, which was apparently even then of mixed Mediterranean and northern origin. Apart from the prehistoric invaders, who brought iron weapons and stimulated the great flowering of Hellenic

civilisation, there have been "Macedonians," Albanians, various types of Slavs, Vlachs, Turks, "Franks," Venetians, and other Italian settlers. Few of these have left any obvious cultural traces, and Greek speech (to be distinguished from classical Greek) and a Mediterranean mode of life have quietly prevailed.

It may be worth noting here that before 1830 there had never been a single united Greek state, for the city states of ancient Greece, though allied at times, were independent of each other. Also from the time of the Macedonian conquest onwards (338 B.C.) the Greeks had never had self-government, but had always been ruled by aliens.

From 1829 to 1919 the area under Greek rule greatly increased. Having obtained the greater part of Macedonia as a result of the Balkan Wars against Turkey (1911-13), and thereby doubled in size, it became the Greek ambition to bring all the Greek-speaking people under one flag; hence the attempt to obtain possession of the western part of Asia Minor. Greek-speaking people had occupied these shores since prehistoric days, though in course of time they had become much intermingled with Anatolian stock. The result of the 1918-23 attempt to bring these lands under Greek rule resulted in vigorous Turkish resistance and the final expulsion of all Greeks from Turkey, with the exception of those in Constantinople (Istanbul). These emigrants, who numbered nearly one and a half millions and were mainly farmers, carpet-weavers, artisans, and merchants, greatly swelled the population of the Greek state, and would have proved a very difficult problem if money had not been forthcoming from British, American, and French sources to prepare the sparsely-peopled northern basins of Macedonia, Thrace, and Thessaly for their reception.

Contrasts between Southern Greece and the Rest of the Country. Modern Greece presents two main types of environments, the true Mediterranean of southern Greece including the islands, and the sub-continental of central and northern Greece, though the coastal strips even in the north feel the sea-influence sufficiently to make this distinction somewhat unsatisfactory. The northern basins and mountains of Macedonia, Thrace, and Thessaly have too severe a winter climate to permit of typical Mediterranean farming, while the mountain massifs (*e.g.* Pindus) tend to be the domain of Vlach shepherds, who speak a tongue descended from Latin. The swampy basins, even when drained, demand a farming technique not suitable to the rest of Greece, and can grow cereals in abundance, whereas from the time of classical antiquity the true Greek lands have habitually suffered from a shortage of cereals and have had to import these from over the sea. Less than one-fifth of the

southern area can be cultivated owing to the mountainous relief, consequently the region is agriculturally poor, and the resources of the inhabitants have been supplemented from the dawn of history by utilising the surrounding sea. As the Mediterranean Sea is rather poor in fish, this activity mainly took the form of a carrying trade, together with the marketing of the goods carried. In addition, the ancient Greeks, particularly the Athenians, whose tillable land was exceedingly small, exported manufactured articles as well as olive oil and wine in exchange for cereals.

Structural Outlines. The Greek lands continue the main structural lines of the country farther north (*see* Fig. 3 and Chapter XXVI), but round the Ægean Sea and in the southern part of the country, they may be looked upon as a drowned mountainous area, with little more than the tops of the mountains standing above sea-level.

The Dinaric system on the west extends through Epirus southwards to the peninsula of the Peloponnesus or Morea, with the single transverse break of the Gulf of Corinth. The direction of the strike, which is followed by that of the mountain chains, is mainly north-west to south-east. An old massif, known as the Pelagonian massif, extends on the east as far south as Mount Pelion on the mainland and a similar massif appears at the south-east end of Attica and in the Cyclades, though here it is much dissected. The rest of the islands mainly belong to the system of young folded mountains, with occasional young volcanic material. In Crete the direction of the folds has obviously changed to an east-west direction, and in Rhodes to south-west to north-east. The various formations of the Dinaric system are so crowded together in Greece that there is a very great diversity of rock, which can be easily seen owing to the general scanty covering of soil and vegetation.

Geographical Regions. Greece may be divided into two main geographical regions, (a) the southern part of the mainland, together with the islands, which are wholly Mediterranean in climate and outlook, and (b) the central and northern sections which are scarcely Mediterranean in climate and lack the sea influence. The distinction made itself felt in the days of classical antiquity, for the greater part of the mountainous region between the Gulf of Corinth and the Albanian frontier lay outside the city states of ancient Greece and was regarded as semi-barbaric. Both these regions require some subdivision on ground of relief.

Southern Peninsular Greece and the Islands. This may be looked upon as classical Greece *par excellence*. The climate is purely Mediterranean, the summers are hot and very dry, the winters mild at low altitudes.

| | Mean Temperature | | Rainfall Per cent. of total falling in June, July, August |
|--------|------------------|--------|---|
| | January | July | |
| Corfu | 50° F. | 78° F. | 4 |
| Athens | 48° F. | 80° F. | 8 |

Even on the higher ground, where winter temperatures are lower, summer temperatures remain fairly high and drought prevails, *e.g.* Tripolis at a height of about 2,000 feet has a January temperature of 40° F., but a July temperature of 73° F.

The differences in relief call for a subdivision into (a) the region centred on Attica, (b) the Morea or Peloponnesus, and (c) the islands.

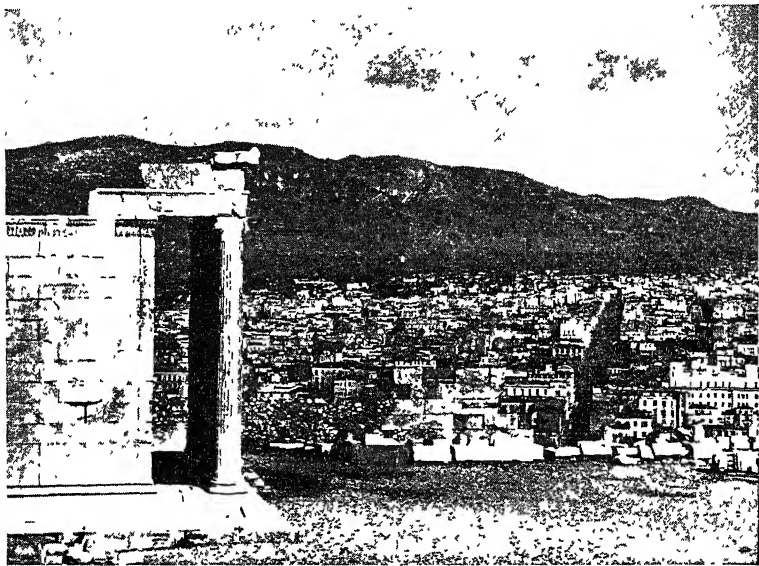
The first of these regions is characterised by a large number of small basins, mainly tectonic, and by discontinuous heights, which, however, can be fairly easily circumvented so as to allow of communication between one basin and the next.

The typical Greek landscape of Attica and the Peloponnesus consists of a small tillable plain above which rise arid foot-hills with a scanty cover of scrubby *maquis*. Since the plains are tiny, the foot-hills play an important part in the rural economy. These foot-hills rise in turn to towering mountains, whose bare bones show through the scanty vegetation, and afford pasture only for sheep and goats. Even on the heights there are few tall trees, although many mountains rise sufficiently high to carry a winter snow-cap: notably the western peaks of Vardussia, Giona, and the celebrated Parnassus, seat of the ancient Delphic oracle. All these are over 8,000 feet, while Helicon, farther east, rises to nearly 6,000 feet from the waters of the Corinthian gulf, and Hymettus and Pentelikon raise their heads high above the Athenian plain. The close juxtaposition of mountain, sea, and plain is a characteristic feature of the landscape of classical Greece and forms one of its main charms.

“The mountains look on Marathon,
And Marathon looks on the sea.”

The general strike of the rocks in the region centred on Attica is from west-north-west to east-south-east, and differs slightly, therefore, from the north-west to south-east direction farther north and west. The climate is Mediterranean, but the low rainfall (*cf.* fifteen inches at Athens) means that the vegetation is poor *maquis*, inclining to steppe in the most northerly basin, that of Lamia, through which flows the River Spercheios.

A southerly row of basins traversed by the River Cephissos formed the ancient lands of Doris, Phokis, and Bœotia, with Thebes (now a tiny town of only about 7,000 people) as the chief city of the latter. By the drainage of Lake Copais, into which the River Cephissos flowed, an area of 50,000 acres has been acquired for agriculture. These basins are traversed by the Athens-Salonika railway, with an eastward branch to Chalcis (17,000) on the narrow seventy-foot channel which separates the island of Eubœa (Evvoia¹) from the mainland. The Eubœa contains mountains reaching at



[Nomlas Photo

FIG. 39.—VIEW OVER PART OF ATHENS FROM THE ACROPOLIS.

Note the flatness of the little plain and the abrupt rise to barren mountains. The building in the foreground is the Erechtheum.

least 6,000 feet in the middle of the island, but the foot-hills of young Tertiary material are moderately fertile and well cultivated. The peninsula of Attica has the advantage of being centrally placed with regard to the three most productive parts of old Greece, (a) the Cephissos basins and the Eubœa, (b) the Peloponnesus, and (c) the Cyclades Islands. In itself it is not very fertile and suffers severely from drought.

Athens. At the present day, as in the past, Athens (Athinai) derives its importance from being the centre of Greek intellectual

¹ The modern forms of Greek place-names are given in brackets.

life and of Greek trade. In ancient times Corinth was equally well placed for trade, but has lapsed into obscurity, partly owing to the liability of the site to earthquakes, and partly because it lacked the ancient prestige which caused Athens to be chosen as the capital of an independent Greece at the close of the Wars of Liberation (1821-29). Athens, with its seaport of Piræus (Piræievs) which adjoins it, has a population of over 1,124,000: Athens, 481,000¹; Piræus, 205,000; suburbs, 438,000. Both are in process of transformation to modern cities along western European lines with the aid of various foreign companies. For instance, the gas supply is in the hands of a French firm, an American company is proceeding



[Photo communicated by Hilda Pendlebury]

FIG. 40.—VILLAGE NEAR ANDRITSAINA, MESSENIA

The barren hills, the small terraced basin, and the little agglomerated village are typical of Mediterranean Greece

with the distribution of water, having built a great dam at Marathon, and an English company supplies the electric light. The Piræus with its suburbs is the main seat of manufactures and commerce in the country and contains shipyards, iron foundries, tobacco, silk, and soap factories.

The Peloponnesus, or Morea. Since the construction of the Corinth Ship Canal in 1893 this peninsula composed of peninsulas may perhaps be looked upon as an island. Although mainly mountainous, it contains a relatively important coastal plain on the north and north-west coasts, and three quite fair-sized plains (for Greece) continuing the lines of the three southern gulfs. Of these

¹Population figures from the 1940 Census

plains Messenia in the west has the greatest rainfall and the densest population and is the only one growing oranges in considerable quantities. The plain of Laconia along the River Eurotas is the longest, being about thirty miles in length, but is only a few miles wide. Its northern interior part is very dry, and the plain of ancient Sparta is now a thickly planted orchard of olive trees. The plain of Argos is engaged at the present day in the production of green vegetables for the Athens-Piræus market, the necessary irrigation water for this arid plain being obtained from wells. Even the central highlands are interrupted by tectonic basins, *e.g.* those of Tripolis and Megalopolis, both traversed by the railway from Corinth *via* the plain of Argos to the Messenian basin and coast. Also there is some useful cultivated hill country, especially in the north-west in Elis. The Peloponnesus is noted mainly for a particular kind of small grape, which are dried and sold as currants, and take their name from the town of Corinth. These grapes are grown on the wetter side of the peninsula, chiefly on the narrow coastal plains and terraced foot-hills of the north and west and in Messenia, and the currants are exported principally from Patras (Patrai; 62,000), the most important port on the west coast. The population in the western Peloponnesus is denser than in any other part of the Greek mainland, apart from Attica, and varies from about 200 to 300 per square mile (*see* Fig. 42).

The Islands. *The Ionian Islands.* The chief of these are Corfu (Kerkira), Leukas (Levkas), Cephalonia (Kefallinia), Ithaca (Ithaki), Zante (Zakynthos). They are composed of the same limestone and Flysch zones as Epirus, with some young Tertiary material, and the relief generally consists of low hill country, although Leukas has a considerable area above 3,000 feet. The westerly position favours a plentiful supply of rain, Corfu having an annual average of 52 inches, and in addition to good rainfall and soil the islands had the advantage of a long period of peace under Venetian and later under British rule which terminated only in 1863, all three factors favouring the growth of a dense population, Corfu having about 445 people per square mile. The islands are well cultivated, Zante and Cephalonia being noted for their currants, and Corfu for olive oil.

The Cyclades (Kikladhes) consist of very diverse material, but mainly of ancient rocks, such as granite, gneiss, marble, and crystalline schists, which contain a considerable variety of minerals. Milo (Milos) and Santorin (Thira) are, on the contrary, composed of young volcanic material, and the south-eastern islands of limestone and Flysch. The interior plateaus and mountains are mainly unproductive, while cultivation is laboriously intensive on terraces and on the tiny plains. Generally speaking, the smaller islands of

Greece are the domain of the peasant proprietor, are very densely populated, and show no increase in population owing to emigration.

The Cretan Arc. Crete (Kriti) with an area of 3,000 square miles is by far the largest of the Ægean islands. Its limestone core forms three main mountain masses, which lie nearer the south than the north coast, and which cause the steep harbourless south coast to contrast with the more gentle northward slope, whose fertile and well-cultivated foot-hills sink seawards to convenient bays. Two cities, Candia (Iraklion; 33,000) and Canea (Khania; 27,000),



[Photo communicated by Hilda Pendlebury

FIG. 41.—TYPICAL SCENE IN THE ÆGEAN ISLANDS.

The hill-top village, the terraced slopes, and the little sheltered harbour are characteristic. The island is Siphnos.

lie on this favourable coast. The island was in turn under Saracen, Venetian, and Turkish rule, but retained a predominantly Greek population and became part of Greece in 1913.

Rhodes is the second largest island of the Cretan arc. Here the strike has assumed a south-west to north-east direction, but the young Tertiary rocks of which it is chiefly composed are infertile gravels, instead of the fertile soils which characterise the northern slopes of Crete. Limestone mountains rise above these hills.

The Islands of the Eastern Ægean. These large islands are detached portions of the western peninsulas of Asia Minor. Samos consists

partly of crystalline schists and limestone and partly of fertile young Tertiary hills and plains. The islands are intensively cultivated and the population reaches the figure of 230 per square mile. Chios (Khios) consists mainly of Palæozoic shales and mountain limestone, and only in the south-east is there a stretch of young Tertiary hill country, but citrus fruits, olive oil, and mastic are produced in considerable quantities. The town of Chios has a population of 22,000. Lesbos (Lesvos) or Mitilini has a variety of structure, with volcanic rocks in the west, serpentine in the centre, and crystalline schists in the east. It specialises in olive oil and tobacco. The chief town, Mitilini, has a population of 28,000. Lemnos (Limnos) and Imbros (the latter being Turkish) are composed partly of sandstones and shales, which give gentle land forms, and partly of volcanic trachyte, which gives rise to infertile hills. Both are rather low-lying.

These islands came under the Greek flag in 1913.

Of the remaining groups of islands, the Dodecanese or Twelve Islands and the Sporades lie near the shores of Asia Minor, and belonged to Italy between the two world wars. The infertile Northern Sporades, however, lie towards the European side of the Ægean, though the division into Europe and Asia in this area may be looked upon as non-geographical.

Northern Greece. Only the coastal strips of this region allow of the characteristic Mediterranean horticulture, since the interior parts are sufficiently high to give rise to low temperatures, particularly in winter, while the low-lying eastern basins are either cut off from sea influences by coastal mountains, as in Thessaly, or exposed to cold northern winds in winter as in Macedonia.

Northern Greece falls into four or five sub-regions: (a) the western coastlands of Epirus and Acarnania, (b) the central mountain mass of Pindus and the Vlach Highlands further north, (c) the eastern coastlands, comprising the basins and mountains of Thessaly, and (d) the basins and mountains of Macedonia and western Thrace.

(a) *The Western Coastlands.* Epirus (Ipiros) consists of a series of limestone ridges and moderately fertile valleys sometimes Flysch-filled, running parallel to the concordant coast. The structural lines are continued from Albania, and there has been some intermingling of population, with the result that disputes about the frontier have arisen. Epirus is terminated on the south by the Gulf of Arta (Amvrakikos), where the sea has breached the coastal ridge at a weak spot and has flooded the interior valleys, but the structural lines are continued to the south of the gulf in Acarnania, though the proportion of lowland increases. To the south, this region is cut across abruptly by the fault lines bounding the Gulf of Corinth. These western mountains, which attain heights of over 5,000 feet,

receive the heaviest rainfall of Greece owing to their height and relatively northern latitude (c. 39° to 40° N.), and though Mediterranean vegetation extends to a height of some 1,000 feet, above that level the winter cold is too great. Yannina (Ioannina), chief town and regional capital of Epirus, at a height of 1,600 feet, has a mean January temperature of 41° F. and a mean minimum temperature of only 17° F. Above the Mediterranean vegetation come deciduous trees such as the sweet chestnut and beech and also conifers, though the timber has been largely cleared for cultivation and pasture. Patches of cultivation extend up to nearly 5,000 feet. Subsistence agriculture and the keeping of transhumant livestock prevail over most of the interior. The coast lands grow vines, olives, and other tree crops on the lower slopes, while the few plains specialise, e.g. the densely-populated deltaic plain north of the Gulf of Arta specialises in oranges, and the Agrinion plain of Ætolia (Aitolia) in tobacco.

There are no railways in north-western Greece except the thirty-mile-long track running inland from the Gulf of Corinth to the fertile basin of Agrinion, and other means of communication are very primitive.

(b) *The Pindus (Pindhos) Zone*, a compact mountain system rising to over 7,000 feet, cuts this region off from land communication with eastern Greece, though transhumant shepherds of both Greek and Vlach speech pasture their flocks here in summer, having come up from their winter quarters in the basins of Thessaly. The region is continued northwards by a rather narrower but even higher mountain mass, which may be termed the Vlach Highlands, culminating in Mt. Smolikas which reaches about 8,500 feet. No railway crosses these high dividing ranges, but a road connects the eastern Thessalian basins *via* Trikkala with the western basin of Yannina, by skirting the north of the Pindus massif. Very sparse population densities characterise these mountains, where life remains exceedingly primitive.

(c) *The Eastern Coastlands*. The Thessalian basins are girdled by mountains even on the seaward side, where the mountains of the Pelagonian massif are here mainly composed of crystalline schists and limestones. The most imposing of these mountains is Olympus (Olimbos), the mythical home of the gods, which lies on the north-eastern border of Thessaly and raises its snow-capped head mightily above sea and plain to a height of 9,574 feet. Separated from Mount Olympus by the narrow Vale of Tempe, through which flows the River Peneus (Pinios), lies Ossa (6,409 feet), while Pelion (Pilion; 5,308 feet) lies farther south. The Vale of Tempe is traversed by a railway from Athens to Salonika, constructed after the Balkan

Wars (1911-13), previous to which there was no rail communication between Greece and the rest of Europe.

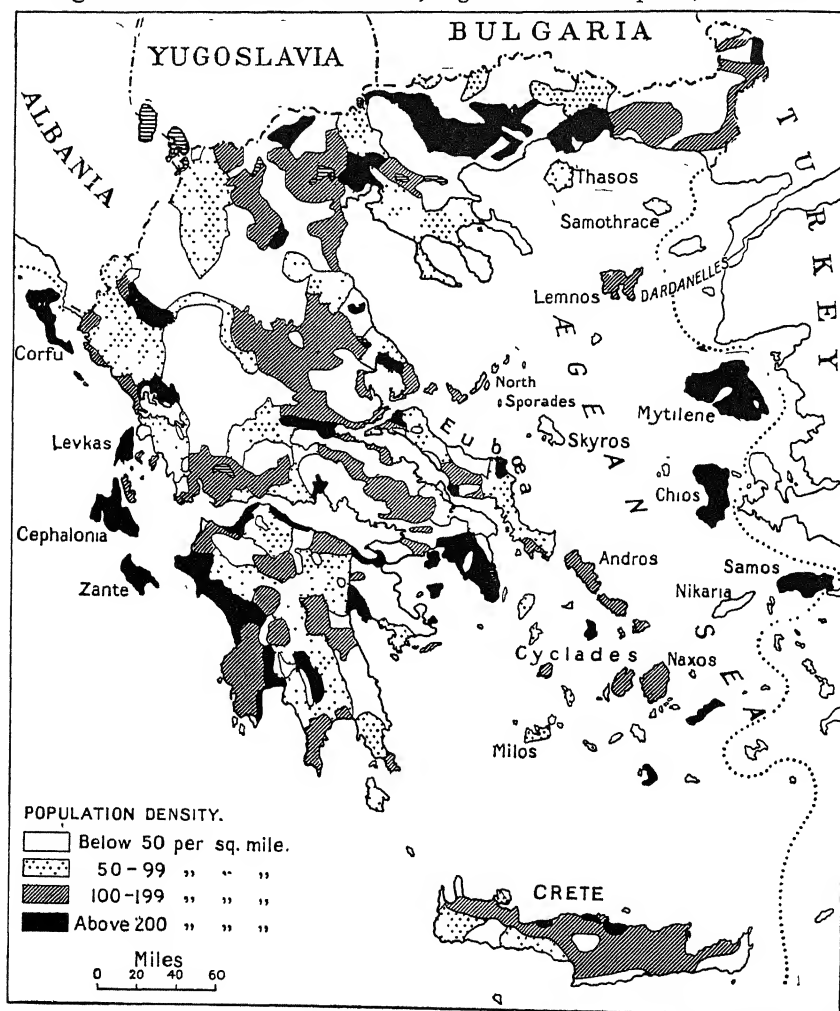
The two tectonic basins of Thessaly, those of Trikkala and Larissa, linked by the Peneus, contain the largest area of level land in Greece apart from Macedonia, but they are not very thickly inhabited. The winters are cold and the rainfall low owing to the exclusion of sea influences by the surrounding mountains, and although with large-scale farming under Turkish overlords they were at one time quite important grain-producing regions, their treeless, steppe-like expanses are not adapted either in climate or relief to Greek horticulture. With assistance from the League of Nations, the Greek refugees from Asia Minor, who were more accustomed to agriculture as distinct from horticulture, were bringing about a transformation of these basins, which grow good grain and tobacco. Two small towns, Trikkala (19,000) and Larissa (24,000), are respectively the markets for the two basins, and where the Gulf of Volos makes the only gap in the south-eastern rim of the basin of Larissa there occurs the only harbour and the largest town of Thessaly, Volos (40,000).

It will be seen that central Greece has little of the Mediterranean type of agriculture and even less of the sea life that characterise the southern part of the peninsula and the islands.

(d) *The Basins and Mountains of Macedonia and Western Thrace.* This region consists of the Ægean end of the central "corridor lands" of the Balkan peninsula, together with the Chalcidice peninsula and the low seaward frontage of the Rhodope massif. Central European and Mediterranean modes of life here intermingle, and owing to this factor and to the convergence of routes, the region is a meeting place for many peoples, Greeks, Bulgars, Yugoslavs, Turks, Vlachs, and even Albanians. For these reasons it is a much disputed area. Greeks predominate in the peninsulas and on the actual coasts, and though their hold was precarious in Turkish times, it was strengthened through the establishment in the 1920's and 1930's of about a million Greek refugees from Asia Minor.

The proportion of lowland to mountain is here higher than in any other part of Greece, and in particular there are large level plains, though these, until recently, were mainly lake-covered or swampy and therefore malarial. These plains mainly lie in tectonic basins which were arms of the sea even in geologically recent times and have been partially filled up owing to a change in the sea-level and by silt deposited in the deltas of the Rivers Vardar, Struma, Maritza, and others. Rising from the swampy, alluvial plains are dissected terraces of the old lake basins and gulfs, and above these

rise the rounded slopes of barren or *maquis*-covered mountains. The higher and healthier parts of the lowland have been important agricultural lands for centuries, e.g. the Drama plain, with its



[After A. G. Ogilvie

FIG. 42.—GREECE: DISTRIBUTION OF POPULATION.

specialised tobacco cultivation, which maintains a population density of some 350 per square mile.

The extensive plains along the lower Vardar (Axios) and

Struma (Strimon), however, which contained large lakes and swamps, were extremely malarial and very scantily populated until the Refugee Settlement Commission began work in 1923. With the aid of the League of Nations, loans to the total value of over fifteen million pounds sterling were raised (chiefly in England), and with this money large-scale drainage works were carried out, especially in western Macedonia. The lakes Yiannitsa, Akhinos and others were entirely drained, precautions were taken against malaria, dams (e.g. the great Kerkini dam on the Struma) were built to control the rivers for irrigation, and entire villages were constructed, together with roads and all the necessary public utility services. As a consequence of these great land reclamation schemes, the wheat production of Greece rose from 250,000 tons in 1922 to 450,000 tons in 1928, and the tobacco production from 25,000 to 61,000 tons. Unfortunately, the war devastated this area and much of the work will have to be done over again.

Economic Summary. Although Greeks are now to be found all over the world pursuing their ancient trades of merchant and shopkeeper, those Greeks who remain in their own land derive their living chiefly from agriculture, with the addition of fishing for those who live along the extensive coasts.

Greece must now be looked upon as one of the poorest countries of Europe. The long stagnant years under Turkish rule emphasised the poverty of natural resources and left the country in a very backward state, the conditions of living, especially in the islands, being extraordinarily primitive; for instance, even wheelbarrows were unknown on Mitilini until a few years ago, when they were introduced by an archaeological expedition. However, the recent immigrants from Asia Minor who were settled in the neglected basins of Macedonia, Thrace, and Thessaly were adding considerably to the wealth of the country. The tourist traffic, also a source of wealth in normal times, is capable of considerable development: the glamour of a glorious past, together with the singular beauty of the Greek coastlands and islands, attracts many visitors. In the world of to-day, however, the absence of coal and iron severely handicaps the traditional Greek carrying-trade and militates against any great development of industry.

The mineral wealth of Greece is varied, but the individual minerals do not seem to exist in any great quantities, though it cannot be said that the resources are fully known. The crystalline massif of the Cyclades and south-east Attica contains silver-lead, worked from the days of antiquity at Laureion in Attica, emery, worked at Naxos, iron-ore, and zinc. The marble of Pentelikon is famous.

Manufactures are little developed, though the working up of agricultural products such as tobacco, wheat, olives, and vines is widespread. Textiles form the chief branch of real factory work, and received considerable impetus with the establishment of the refugees from Asia Minor in Athens and Salonika (mod. Gk., Thessaloniki). The carpet industry also received a great fillip. The prohibitive tariff on imported manufactured goods apparently did not give the intended stimulus to home manufactures, owing to the same combination of unfavourable conditions that prevails in the rest of south-eastern Europe, *i.e.* lack of coal or other fuel, of iron-ore, of capital and experience, and of a large home market. It seems probable that the rivers of northern Greece could be harnessed for hydro-electric power, but frontier troubles and lack of capital prevent this.

Practically all the Greek exports are specialised agricultural products. Tobacco, which heads the list, is marketed under the name of "Turkish" and is the finest of that type in the world. After tobacco come currants, wine, sultanas, olive oil, olives, and dried figs. The list of imports is usually headed by grain, with textiles coming a poor second. Coal, sugar, timber, raw cotton, and rice are also imported. There is an adverse balance of trade, the imports being valued at twice as much as the exports, but this is partly offset by savings sent home by emigrants and partly by the earnings of the mercantile marine. Comparisons with Norway will here suggest themselves.

The nineteenth century saw a great renaissance of Greek shipping, especially in connection with the grain trade of the Black Sea. This took place at a time when it was still profitable to use sailing ships, and the change to steam came late. The twentieth century Greek mercantile marine was relatively small, though large per head of population, the tonnage of engine-driven vessels having amounted to 1,812,000 in 1939. Greece retained a considerable carrying trade in the eastern Mediterranean up to 1939, but almost three-quarters of the total tonnage was lost during the war.

REFERENCES

There is no text-book on the regional geography of Greece available in English. *The Greek Commonwealth*, by A. Zimmern (5th ed., Oxford, 1931), gives an excellent account in the introductory chapters of the unchanging elements of the Greek land and life. O. Maull's *Griechisches Mittelmeergebiet* (Breslau, 1922) is a useful little book.

"Population Density in Greece," by A. G. Ogilvie, in *The Geographical Journal*, vol. CI, 1943, is accompanied by a detailed map. *La Macédoine*, by J. Ancel (Paris, 1930), deals with the recent developments in that area.

SECTION II—WESTERN EUROPE

CHAPTER IX

GENERAL INTRODUCTION TO WESTERN EUROPE

THE British Isles, France, Belgium, and Holland may be conveniently grouped together under the title of western Europe. The region is not so clearly a unit as southern Europe, but the various countries have certain similarities. For instance, climatically they all have a similar oceanic régime, structurally they lie mainly within "Hercynian" Europe, and in relief they consist mainly of ancient horsts alternating with fairly extensive plains. The main exceptions are the southern and south-eastern parts of France, which lie within the region of Mediterranean climate or of Alpine folding or of both, and the northern parts of Scotland, which resemble Scandinavia in structure and relief. The various countries have also been closely bound up with each other in their political and economic history, and developments took place there which have profoundly changed the face of the world during the past two centuries and which still continue to make their influence felt even in Europe itself.

Western Europe was fortunate in coming in contact with Roman civilisation at an early date, an occurrence which was aided, no doubt, by the facility of access from the Mediterranean Sea through France by the Rhône-Saône corridor and the Aquitaine basin, whilst the mild oceanic winters were not unkind to a southern people. Moreover, in spite of the barbarian invasions of the fifth and later centuries, civilisation was not completely swept away, and in many cases the barbarians themselves had been already in contact with Roman ways of life. Since the intruders came mainly from the east, the westerly position protected the region from receiving the most uncivilised type of invader, and also saved it completely from some of the invasions, the brunt of which fell on the peoples of central and eastern Europe. Consequently western Europe was able to develop with relatively few checks, once it had recovered from the long series of invasions which ended about the beginning of the tenth century, whereas aggression on the part of invaders in eastern Europe continued right down into the seventeenth century, and even later, *e.g.* the Tatars roamed Bessarabia as late as 1800.

In spite of the fall of the Roman Empire, the pattern and inspiration for western civilisation all through the Middle Ages continued to be the Mediterranean lands, whose people also took the lead in the discovery of America and of the sea route to the Indies, though the English, Dutch, and French reaped much of the benefit. It was not until the end of the eighteenth century that developments took place in western Europe which gave an entirely new turn to civilisation, and which also gave the countries of western Europe a decisive

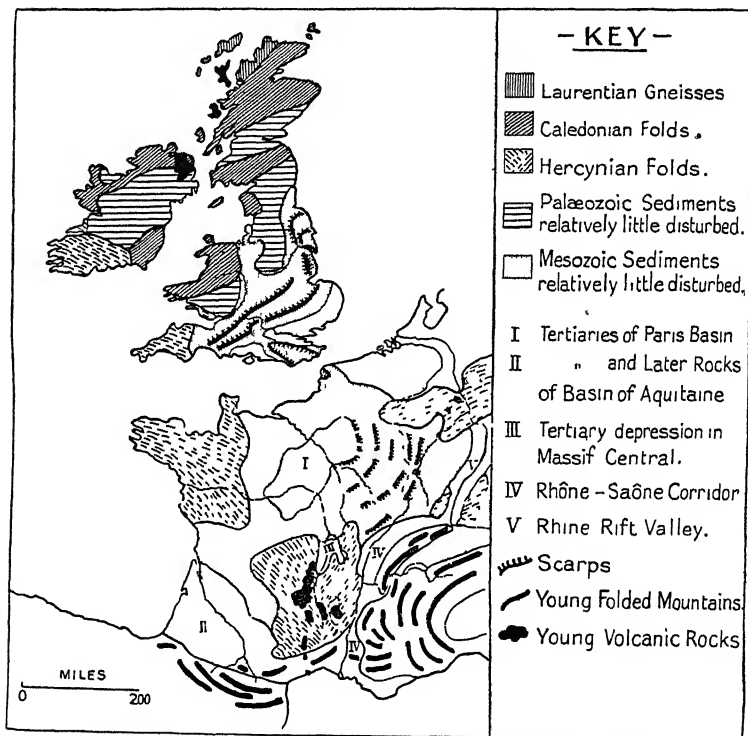


FIG. 43.—STRUCTURAL DIAGRAM OF THE BRITISH ISLES AND FRANCE.

lead. These developments were associated with three "revolutions," usually known as the French Revolution, the Industrial Revolution, and the less widely known Agricultural Revolution. It is true that the ferment which became obvious during the eighteenth and early nineteenth centuries had been working silently for a long time, but the rest of the world had hitherto paid little attention. The French Revolution brought to the notice of the greater part of Europe the idea of personal liberty, which had slowly become

established in England and the Low Countries (Belgium and Holland) during the previous five centuries, whereas up to the time of the French Revolution individuals in most of the other countries, including France itself, were still bound by feudal restrictions, which among other things hindered their free movement from place to place, and imposed severe restrictions on the occupations they could adopt. These restrictions applied not only to serfs, who were economically bound to the soil, but also to other ranks; for instance, a German noble was not allowed to practise a trade or to become a manufacturer, and a German burgher was not allowed to own a landed estate. The liberation of the individual, though it took place in England and Belgium from no humanitarian motive, set free an abundance of talent and enterprise, which first made themselves felt in those countries where feudal restrictions first disappeared. Without the break-up of the feudal organisation of society it is doubtful whether the Agricultural and Industrial Revolutions could have taken place.

The Agricultural Revolution led to a great increase in the yield from the soil by substituting an improved system of agriculture for the old methods which had been practised with little alteration from Roman times and even earlier. The chief change lay in the abolition of the wasteful biennial or triennial fallow, and usually involved also the abolition of what is known as the "open-field" system of farming. The great hedgeless open-field of each village had been divided usually into three sections, one of which was devoted to wheat, the second to a spring-sown cereal, while the third lay fallow, the rotation usually being rigidly enforced. Each landowner held one or more strips in each section of the field, instead of holding all his land in one continuous farm. In addition, each village possessed common land for the grazing of livestock, though the fallow land was also largely used as common pasturage; but as there was insufficient winter grazing for the cattle, many had to be slaughtered every autumn; scientific cattle-breeding and fattening were almost unknown. This old system persisted in parts of eastern Europe well into the present century, but was done away with in England mainly under the Enclosure Acts of the eighteenth and early nineteenth centuries, while in southern and eastern England it had disappeared considerably earlier. The new methods had indeed been evolved in Flanders as early as the thirteenth century, but were first adopted on a large scale in England, later in the other lands of western and central Europe, and finally spread to Russia in the twentieth century. The abolition of the wasteful one-third fallow was made possible by the introduction of clover and root-crops, of heavy manuring and of the development of scientific

rotations. The growing of clover on land previously kept fallow actually increased the yield of cereals in the following year, and together with the root-crops provided winter fodder for the livestock, which in turn made available a greatly increased supply of manure. The new methods brought more land under cultivation, resulted in much heavier yields, allowed a great increase in the quantity and quality of livestock, and therefore provided more and better food for a rapidly increasing population. They also involved a great diminution in the common grazing lands, for poorer soils could now be brought under cultivation, and of course they brought about the abolition of the compulsory rotation, though the wasteful strip-system of land-holding still persists in many parts of Europe.

This revolution put Europe in the forefront of the agricultural continents. It is not always realised that Europe in normal times is a greater producer of foodstuffs than the great exporting continents, such as North America; that Europe produces more wheat, meat, and dairy-produce than all the rest of the world put together, more than twice as much barley, and nine times as many potatoes. It also produces nearly half the world's sugar.

In spite of this large home production, Europe has to import more food than all the other continents combined, in order to feed the large industrial population which has come into being as a result of the Industrial Revolution.

The Industrial Revolution originated in England, and is perhaps the most important of the three revolutions mentioned. It caused, and is still causing, immense changes in the distribution of population, in the methods and localisation of industry, in the methods and routes of transport, in the type and quantity of raw material needed, and indeed in practically every aspect of human life.

GREAT BRITAIN AND THE INDUSTRIAL REVOLUTION

The Industrial Revolution hinged chiefly on the invention of steam-driven machinery, which required coal to feed it and iron for construction if it was to stand the strain of the new driving power. Since the mechanism of the steam-engine is supposed to have been known to the ancient Greeks, but remained neglected for nearly 2,000 years, its re-invention in England might have remained equally local and unknown but for a series of favourable factors, which led to its great improvement and its rapid adoption for different kinds of work, including the mechanisation of the iron and textile industries and of transport. This rapid adoption seems to have been due to the fact that Great Britain had already developed overseas markets

(mainly for textiles) which were expandable at such a rate that any invention which would speed up production and cheapen costs was seized upon with avidity. This market consisted largely of colonies, founded by widespread settlement overseas of people from the British Isles, and partly obtained at the expense of the Dutch and French during the seventeenth and eighteenth centuries, when the English definitely established themselves as supreme at sea. With the mechanisation of production, increased quantities of manufactured goods became available at such low prices that the British Isles were enabled to secure the "whole world" as a market for nearly a century, though other regions, equally well equipped by nature, have since successfully challenged her monopoly.

Two of the fundamental necessities for the mechanisation of industry were coal and iron, which occur in Great Britain, though not in Ireland, in large quantities. The steam engine was invented in 1710 to pump water out of coal mines, a significant fact because very few other parts of the world at that time were using coal for fuel, timber being the usual fuel in the forest belts, and straw or dried dung in the non-forest areas. England, however, was suffering from a shortage of timber as early as the seventeenth century in spite of being in the forest belt, a shortage which may at first sight seem surprising. It should be remembered, however, that the soils of the south-eastern lowlands were good enough to be cleared for agriculture, apart from the growing of the great oaks needed for shipbuilding and other constructional purposes, and, on the other hand, the bare uplands and mountains of the north-west seem never to have been forested within historic times. Moreover, the British Isles have only one quick-growing native conifer, the Scots pine, and this seems to be a survivor from prehistoric climatic conditions and now reproduces itself with difficulty. As early as Cromwellian times the Baltic lands were supplying England with timber products such as masts, tar, etc. Coal, on the other hand, was plentiful, so near the surface in parts that it could be mined by means of adits or shallow pits, and so near the sea-coast that this bulky material could be transported cheaply for hundreds of miles, *e.g.* from the Durham coalfield to London where was the greatest demand, hence the old term "sea-coal." Land transport for such a heavy and bulky commodity was quite impossible before the Industrial Revolution, and Great Britain lacks large navigable rivers for successful inland water transport.

The steam engine did not become a really useful generator of energy until the improvements by Watt in 1782 reduced the amount of coal required and enabled the engine to be used at a distance from the actual coal mines and for divers purposes. By that time methods

of smelting iron by means of coke, in place of the scanty supplies of charcoal, had not only been invented (*c.* 1730) but had become generally known (*c.* 1750), while the canal system had been started mainly with a view to transporting coal, the first canal being built in 1761. The manufacture of cotton goods had already begun, the invention of the spinning "jenny" (1767) and Arkwright's water-frame (1768) had speeded up the production of yarn, and the latter had brought in the use of water power. Crompton's "mule" (1775) combined the virtues of the jenny and the water-frame and enabled very fine yarns to be spun.

The change from small, home hand-manufactures to large-scale factory-industries using steam power, and the development of great industrial agglomerations came slowly, but the Revolution had been achieved in its essentials by about 1830. The building of the canals and the invention of railways and the steam locomotive allowed food to be transported to the new densely-populated industrial areas, raw materials to reach the factories, and the finished product to be distributed to internal markets or the seaboard. The rapid increase in wealth during the period depended mainly on the export of textiles, of coal, and of iron and steel goods to the rest of Europe, and to the Americas. Once mechanisation was started, one branch of mechanised industry helped another. Never before had the world seen such a brilliant outburst of inventive genius.

It may perhaps be argued that a series of fortuitous events combined to start the Industrial Revolution in England rather than in any other part of the world, but since the question involves the whole problem of the origins of culture and the whole area of the world, it is too vast to be treated here, except in bare outline and as regards Europe.

England's possible economic competitors at the end of the eighteenth century were those countries of Europe which already possessed considerable manufacturing industries at home, foreign or large home markets, some kind of transportable power capable of driving machines, and capital and labour available for expanding industries. A little consideration will show that the countries possessing these advantages at that time were very limited in number. Germany, which subsequently became England's chief European rival in industry, was only a "geographical expression," a mosaic of over three hundred states divided from each other by separate customs-barriers and still so completely in the feudal age that the bulk of the population was tied to the soil in serfdom and therefore unable to engage in manufacturing, while the manufacturing guilds of the towns were sufficiently strong to prevent any innovations and to prevent others from competing. On geographical grounds the great Ruhr coalfield of Germany offered possibilities for the

development of early mechanised industry, since the coal occurred at the surface, near iron deposits, near old-established iron and textile industries, and near the navigable waterways of the Rhine system. (See Chapter XX.) These advantages, however, were negated for a time by non-geographical factors, though they ultimately prevailed.

Of the countries with considerable seaboard, overseas possessions, and trade, only France possessed any considerable deposits of coal, but, like Germany, was still hampered by the survival of feudalism and the lack of an adequate banking system. However, before the great disturbance given to economic life by the French Revolution, France had copied England's example and had begun the mechanisation of the cotton industry, using water-driven machinery as in England, and

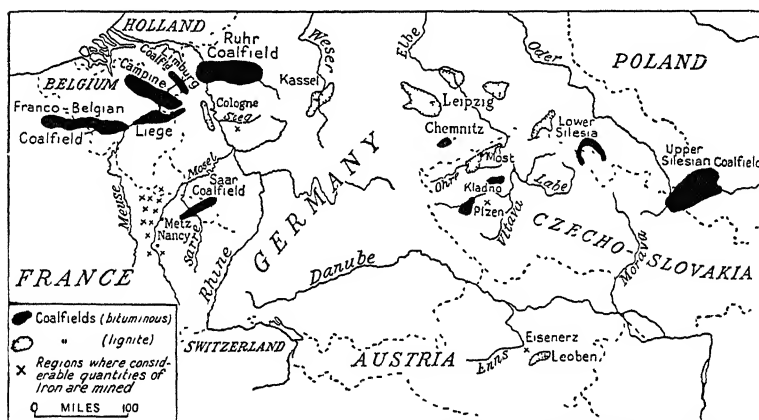


FIG. 44.—THE GREAT COALFIELDS AND IRON-ORE DEPOSITS OF CENTRAL EUROPE, FRANCE, BELGIUM, AND THE NETHERLANDS (Pre-1938 frontiers).

had also begun the smelting of iron by coke; in both cases using smuggled English designs. The French Revolution and the Revolutionary Wars put a stop to the normal economic development, and by the time peace was restored on the Continent, England had definitely established her world lead.

The inventions made in England and Scotland in connection with the Industrial Revolution were gradually introduced into other countries of Europe, and into the U.S.A. This process was slow, partly owing to Britain's efforts to stop the leakage of information in regard to the new machinery, partly owing to the tremendous start gained by Great Britain, partly owing to internal disturbances and cultural backwardness in the southern and eastern parts of Europe. In one way or another, however, practically the whole

of Europe was influenced by the Industrial Revolution by the end of the nineteenth century, Russia being the last of the great countries to be affected. Those countries which were well endowed with coal and iron deposits, particularly Germany, Belgium, and France, established great industries on similar lines, mainly behind defensive tariff walls. Those countries which had little or no coal either imported British coal for their manufacturing industries, or found their own expensive hand-industries killed by the cheaply produced factory goods. In many countries both processes took place almost simultaneously, *e.g.* in Sweden and Italy. The invention of railways and the steam locomotive on the whole helped Britain's economic rivals, particularly the more continental powers, and to some extent negated Britain's initial advantages, by enabling widely separated iron and coal supplies to be brought together.

The great new urban agglomerations made demands for foodstuffs on a scale hitherto unknown, while the new improvements in transport enabled foodstuffs to be imported from a great distance. In response to this demand, large-scale farming for export began on the prairies of south-eastern Europe even before it began in America, and the new cheap foodstuffs sounded the death-knell of grain production in those parts of Europe less favoured by climate, relief, and soil. Thus in Great Britain and Ireland, the Scandinavian countries, Denmark, Holland, Belgium, and parts of France, in fact, in all the rainy areas of north-western Europe, cereal production declined, to be replaced by specialised farming, for dairy-produce, high-grade meat, fruit, flowers, and vegetables, which found a ready market in the manufacturing towns.

Changes which have taken place during the twentieth century have not diminished the value of the coalfields. The substitution of electrically-driven machinery for steam-driven machinery has made less difference than might be expected, for in spite of the great development of hydro-electricity, the fact remains that most of the electricity supplies of Europe are generated from solid fuels. Moreover, in modern times, coal has acquired an additional importance; it is now not only a source of power but a raw material. From coal the heavy chemical industries derive a vast range of products, including synthetic oil and rubber, dyestuffs, fertilisers, explosives, solvents, plastics (including nylon), and other synthetic commodities whose number increases from day to day. Coal is actually in greater demand than ever, though the markets have changed somewhat with the development of hydro-electricity in the Mediterranean and Scandinavian countries, but as the most accessible and easily worked seams have already been exhausted in the older coalfields of Europe, the cost of extraction is likely to

increase. This change affects Great Britain, France and Belgium most acutely, but is beginning to be felt in the coalfields of western Germany also.

Perhaps the most extraordinary aspect of the industrial development of western Europe is the large amount of imported raw materials used. This is particularly noticeable in the case of Great Britain, which has to import nearly all the raw materials for its great textile industries, nearly all its timber requirements, the greater part of its non-ferrous metals, and in recent years large quantities of iron-ore also. So firm was Britain's control of the sea that it does not seem to have occurred to nineteenth century economists that there was anything peculiar or precarious in Britain's reliance on the sale overseas of manufactured commodities made chiefly from imported raw materials. The period 1815 to 1914, when Britain was undoubtedly the leading manufacturer of the world, was a century of peace and progress, with a rising standard of living in most countries, and a consequent ability of world markets to absorb large quantities of high quality goods. Nevertheless, the development of industries in other countries, *e.g.* U.S.A., Germany, Italy, Japan, India, was forcing Great Britain to abandon the manufacture of certain products which could be made more cheaply elsewhere, *e.g.* cheap textiles, and to concentrate on branches of industry which demand the utmost skill, precision, organisation, and experience, such as the engineering and chemical industries, and the same is true to a large extent of the other countries of western Europe, including western Germany. The maintenance of millions of people by the sale abroad of manufactured commodities and their dependence on imported foodstuffs obviously involves grave risks which are all too apparent in the mid-twentieth century. Not only is peace essential, but even in times of peace, the smooth workings of the foreign exchanges and the reduction of tariffs to a reasonable level are prerequisites. The great slump in world prices, which took place round 1930, the world-wide unemployment among factory workers, and the so-called over-production in agriculture seem to have been due to a breakdown of the means of exchange rather than to any real over-production of either industry or agriculture.

It is clear that the relatively high standard of living, achieved both by industrial and agricultural workers in western Europe as a result of the Industrial and Agricultural Revolutions, depends upon the full working of mines and factories, upon the full working of all the means of communication and exchange, and upon the full exploitation of skill. Any retrogressive movement towards a simpler economy would bring disastrous results.

REFERENCES

On the Industrial Revolution J. H. Clapham's great work entitled *An Economic History of Modern Britain* (vol. I, *The Early Railway Age*, Cambridge, 1926), and the same author's *The Economic Development of France and Germany, 1815-1914* (Cambridge, 4th ed., 1936), give a wealth of interesting detail. L. C. A. Knowles' *The Industrial and Commercial Revolutions in Great Britain during the Nineteenth Century* (London, 1911) gives a shorter account. The first of the above-mentioned works also gives some account of the Agricultural Revolution, but the contemporary writings of Arthur Young and Cobbett (*Rural Rides*) are easily accessible and give vivid pictures.

On the British Isles, H. J. Mackinder's *Britain and the British Seas* (Oxford, 2nd ed., 1906), *Great Britain*, edited by A. G. Ogilvie (Cambridge, 2nd ed., 1928), *Les Iles Britanniques*, by A. Demangeon (Paris, 1927, translated E. D. Laborde, London, 1939), and *The British Isles*, by L. D. Stamp and S. H. Beaver (London, 2nd ed., 1937, and later editions), are standard works. See also *The Land of Britain; Its Use and Misuse*, by L. D. Stamp (London, 1948), and *Britain's Scenery and Structure*, by L. D. Stamp (London, 1946); W. Smith's *Economic Geography of Great Britain* (London, 1949).

CHAPTER X

FRANCE

FRANCE is the largest country of Europe, with the exception of the U.S.S.R., and is nearly twice as large as the British Isles. Apart from the bordering chains of the Alps and the Pyrenees, France belongs structurally to the Hercynian region of Europe with its old massifs and its included basins and scarplands.

The advantages of its position and physical lay-out have often been stressed. It is the only country of Europe, except Spain, which has coastlines on both the Mediterranean and the Atlantic, and in the case of France these coasts are mainly bordered by lowlands which allow easy access inland, whereas Spain is hampered by the presence of coastal mountains which hinder movement to and from the interior. Instead of the mountain rampart, which elsewhere borders the northern side of the Mediterranean Basin, there is here a great depression represented by the Gulf of Lyons (Fr., Golfe du Lion), from which two relatively easy routes lead northward into the great lowlands of northern and western France, the more important being the Rhône-Saône route leading due north towards the lowland known as the Paris Basin, and the other, leading north-west *via* the Carcassonne Gap, into the lowland basin of Aquitaine. These natural routes allowed the early spread of Mediterranean civilisation northwards into France beyond the range of Mediterranean climate, and France is the only non-Mediterranean country where Roman civilisation retained its hold despite the subsequent barbarian invasions.

The Rhône-Saône route in particular is still of great importance, since it puts the densely peopled lands of northern France, Great Britain, and the Low Countries (Belgium and Holland) into easy communication with the Mediterranean-Suez-Orient route. Not only does it immediately connect two natural regions of unlike climate and products, that is to say, the summer-drought region of the Mediterranean with the rainy region of north-west Europe, but it also provides a useful link in one of the great highways of the world. As already noted in Chapter I, the only other easy natural route through the northern mountain-border of the Mediterranean Sea is *via* the Bosphorus and Dardanelles, but the western route through France is more important commercially at the present

time, because western Europe is more thickly populated and more developed economically than eastern Europe. Passenger traffic is particularly important owing to the saving of time *via* the Rhône-Saône land route as compared with the long sea route *via* Gibraltar, round Spain and Portugal and through the Bay of Biscay.

Among the advantages of the physique of France the high percentage of lowland must take a foremost place. None of the great established countries of Europe has so much, with the exception of Russia, where the advantage of possessing a great expanse of lowland was negated by adverse climatic and historical conditions. Moreover, the lowlands of France are in the main fertile, and further, there is easy communication between them.

A favourable climate is ensured both by the position and relief of the country. Lying between latitudes 42° N. and 51° N. France possesses only a narrow southern strip within the Mediterranean climatic province, while the rest has cyclonic rain throughout the year. Since, however, the southern coastlands of France lie on the northern edge of the belt of Mediterranean climate the period of winter rain is prolonged even here, and there is rarely excessive drought, while the near presence of high mountains provides water for irrigation. The relatively low latitude of even the rest of France gives the country a climatic advantage over the other parts of Europe which have also abundant cyclonic rain, since not only the fertile lowlands, but the slopes of the mountains themselves, can be cultivated. Whereas in England at latitude 55° N. cultivation ceases above about 700 feet, in the French Alps of Savoy about latitude 45° it can be carried up to 4,500 feet (*see* Fig. 1), and even above 6,000 feet in favourable exposures and slopes. Moreover, the hotter summers and shorter winters allow the cultivation of a greater variety of crops, including the heavy yielding maize and the valuable vine. Since about 1900, also, the advantage of the early spring has been realised in the cultivation of early vegetables and fruit for the dense industrial populations of lands farther north, particularly of Great Britain. The disposition of the mountains and plains allows the penetration over the whole country of the rain from the west.

In addition to the rich agricultural possibilities of France, the country also possesses considerable wealth of minerals and water-power, though in regard to coal, the essential fuel of the modern world, the endowment is not very great, France being fourth among the coal-producing countries of Europe. The only really important coalfield, moreover, is situated in the extreme north-east of the country, so that distribution to the south and west of the country is costly. Moreover, owing to the nature of the seams, the coal is

difficult to mine and therefore expensive, and the cost puts a brake on industrial development under modern conditions, especially when the import of foreign fuel is restricted. The deposits of petroleum are negligible, but hydro-electricity available from the rivers of the French Alps and Pyrenees is reckoned to put France fourth among European countries in regard to the amount of potential water-power, and of this a good deal is developed. In iron, however, the great present-day industrial necessity ranking second only to coal, France is the richest country in Europe and the second in the world, the iron mines of Lorraine yielding over forty million tons of ore per annum in some years. (*See Appendix C and p. 154.*)

Unfortunately, the advantages of size, position, relief, and climate which helped to make France *la grande nation* are not sufficient to maintain her as a great power in the modern world. There is not enough coal to sustain a really large industrial output, and moreover, the chief coal and iron mines lie very close to the vulnerable eastern frontier. Whether hydro-electricity can be developed sufficiently to make up for the lack of solid fuel remains to be seen. As with other countries of western Europe, France has large overseas territories whose resources greatly augment those of the home country.

Structure and Relief. The main outlines of the structure and relief of France are simple.

There are four Hercynian horsts, namely the Massif Central, the Armorican Massif, the Vosges, and the Ardennes (*see Fig. 43*). The first three are wholly in France, the last extends through Belgium to join the Rhine Highlands. These horsts, in common with most of the other Hercynian massifs of Europe, were worn down to base level and generally submerged beneath the Cretaceous Sea, only to be raised again in Tertiary times in connection with the earth movements involved in the formation of the young folded mountains. The horsts nearest the Alps underwent the greatest uplift, particularly the Massif Central and the Vosges, but the Armorican Massif was raised relatively little. All these horsts consist mainly of Palæozoic and earlier rocks, including a considerable proportion of granites, gneisses, and other hard rocks which provide thin infertile soils. The Hercynian massifs of France generally form dissected infertile highlands, with the exception of the Armorican Massif which, although dissected and infertile, is mainly below 600 feet in height.

Around the Massif Central lie three basins of sedimentation. The Paris Basin and the Basin of Aquitaine form the principal lowlands of France, and are composed of strata of Secondary and Tertiary age. In the Paris Basin scarpland formations are well

developed, particularly on the east, since the upthrust of the Vosges Massif caused a pronounced tilting of the strata and allowed erosion to emphasise the difference between the harder and softer rocks. The Saône-Rhône depression is largely an area of sedimentation, but some of the rocks became involved in the Alpine folding so that the area of lowland is now narrow and discontinuous.

The young folded mountains of the Alps and Pyrenees form the frontiers of France on the south-east and south-west. On the eastern frontier, France also includes portions of the Rhine rift valley and of the Belgian Basin of sedimentation with its valuable coalfield.

NATURAL REGIONS

The Paris Basin. *General.* This is the most important agricultural lowland of western Europe, both as regards size and productivity. It measures some 200 miles from the English Channel (Fr., La Manche) to the Massif Central, and some 300 miles from the Armorican Massif to the Vosges. The greater part of the area is under 600 feet high, except in the eastern part (Lorraine), which, though geologically part of the basin structure, is often placed in a separate geographical region on account of its differences of relief, drainage, and economic development.

Structurally the basin is formed of strata of Secondary and Tertiary rocks which were laid down on a gradually sinking floor. During the Tertiary period the outer edges were slightly tilted up like the rim of a saucer, and the forces of erosion set to work to strip off the upper and younger layers, especially from the higher outlying part of the basin. Accordingly the older strata are now exposed round the rim and progressively younger strata are met as one goes towards the centre. The oldest rocks belong to the Triassic system and are found bordering the Vosges in Lorraine, but as the basin was mainly land in this period the deposits were limited in extent and no other outcrops occur, though borings reveal rocks of this age on the southern and western borders. The Jurassic system is much more widely represented, and rocks of this age probably floor the greater part of the basin, and they appear at the surface in a horseshoe-shaped outcrop on the eastern, southern, and western sides. On the north this formation appears only in denuded anticlines. The Cretaceous formation outcrops in a great ring, somewhat irregularly shaped, round the Tertiary beds of the middle of the basin. These Tertiary beds have their longer axis from north-east to south-west and are transgressive over the Jurassics in the south of the basin.

The strata consist of very varied types of rock, and the effect

of denudation and peneplanation has been to produce rapid alternations of outcrop. The formation of scarps was thus favoured, and these are particularly noticeable in the eastern part of the basin, partly because the dip or tilt of the rocks is greater, partly because of the alternation of layers of rock of contrasting type, and partly because a greater number of formations are represented. The basin is also crossed from north-west to south-east by a number of

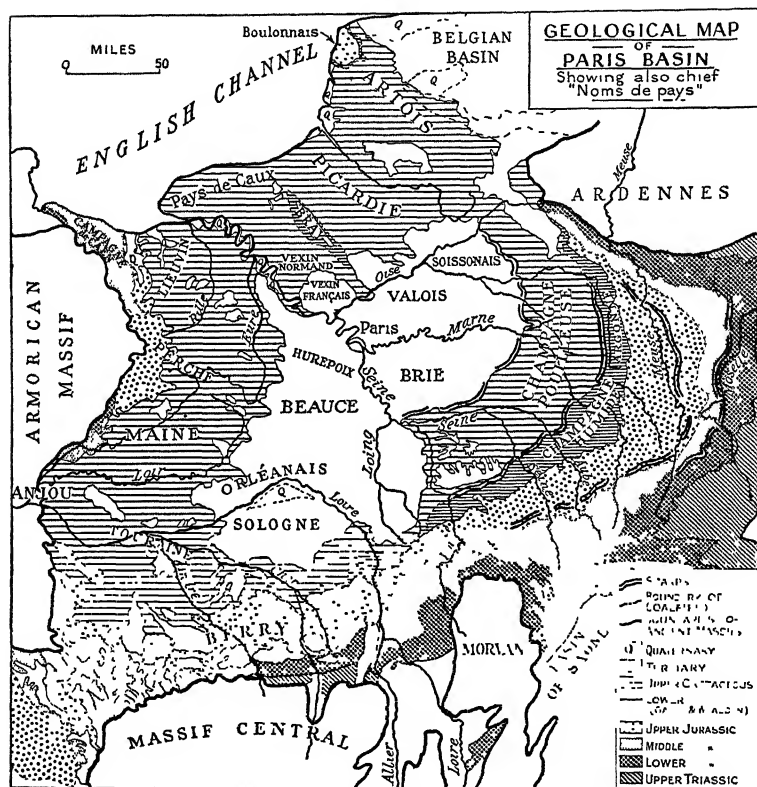


FIG. 45.—GEOLOGICAL MAP OF THE PARIS BASIN.

shallow folds, but apart from the north-eastern region, these rarely have any effect on the relief. The rapid alternation of outcrops naturally causes rapid alternations of landscape, a fact which has long been appreciated by the inhabitants who have applied distinctive local names (*noms de pays*) to regions which possess distinctive individuality, though this individuality is not always very noticeable to the traveller at first sight.

The Paris Basin possesses in marked degree the type of variety which was needed before the Industrial Revolution when almost all the needs of man had to be supplied in a comparatively small area. There is land suited to wet crops and dry crops, to cereals and market gardens, to vine and to orchard; there are dry pastures and wet pastures, the first suited to sheep and the second to cattle; there are wooded areas for supplying timber for fuel and building; there is good building stone, markedly absent from the similar London Basin, as well as material for bricks, cement, and plaster of Paris. There are also small bodies of iron on the borders of the basin which were useful before the vast Lorraine iron-field could be



FIG. 46.—THE RIVER YONNE AT JOIGNY.

Broad, placid, navigable rivers are characteristic of the Paris Basin.

worked. And to bring these commodities from one place to another was the useful, [slow-moving Seine and its tributaries,] which are still of considerable importance, in spite of the development of railways and roads.

The basin may be conveniently divided into five subdivisions as follows: (a) the central region with Paris, (b) the scarplands of Champagne and Burgundy, (c) the scarplands of Lorraine, (d) the south-west and middle Loire region, (e) the coastal regions of Normandy and Picardy.

In addition, the region of the lower Loire may be conveniently treated here, although, geologically it belongs to the Armorican Massif.

The Paris Basin. (i) *The Central Region, including Paris.* This region corresponds broadly to the outcrop of Tertiary deposits, but without their southern extension into the region of the middle Loire. These deposits constitute a complex alternation of limestones, sandstones, and clays, with a general predominance of limestone which forms the most widespread subsoil, a noteworthy and advantageous contrast to the London Basin, where in a similar position the clays predominate. The limestone plains, usually about 300 to 600 feet high, are mainly covered with superficial deposits of loam (*limon*). This is a finely grained deposit, believed to consist of wind-blown material which was subsequently re-sorted by water. In fertility and appearance it is scarcely to be distinguished from *löss* (cf. p. 246), and it gives rise to very suitable soil for the cultivation of cereals and sugar-beet. In parts, however, particularly south-east of Paris, the place of the *limon* is taken by the impermeable clay-with-flints, and dairy cattle become important on these heavier and moister soils. Towards the centre of the basin, near Paris, the converging rivers have slightly incised their valleys and have cut up the level limestone plain or low plateau into isolated patches. They were able to do this owing to the lowering of the base level of erosion which took place in Pleistocene times, and in doing so they have exposed small areas of sandstone and clay which are usually less fertile than the limestone, the sands in particular being often left under forest. The alluvium of the valleys themselves contrasts rather markedly with the stretches of dry plateaus between them, and allows the cultivation of green vegetables and other market-garden produce needing a good deal of moisture.

Apart from Paris the whole central region is entirely agricultural, but many *noms de pays* indicate slight differences between one part and another. Of these, Beauce, situated midway between the Seine and the great bend of the Loire, possesses the most marked individuality. The level limestone plain, covered with a great thickness of *limon*, is very fertile in spite of the absence of running water. With its lack of trees and hedges and its devotion to cereals and beet-sugar, Beauce recalls very strongly the *löss*-covered regions of central and eastern Europe. It is one of the main granaries of France. In Hurepoix, between Beauce and Paris, the limestone has been eroded by many small streams and the underlying sands and clays appear. When sufficiently fertile these are devoted to market-gardening for Paris, but otherwise have been left under forest (as in the case of the sands of Fontainebleau), and the district forms a "playground" for the great city. East of the Seine, the different types of landscape alternate with each other to a greater extent. Brie, between the Seine and Marne, has

considerable areas covered with clay-with-flints in addition to *limon*-covered stretches, and is noted for the variety of its rich agriculture. In particular its cheese is well known. Soissonais and Valois show an alternation of limestone plateaus and humid valleys.

The central basin terminates on the east in a well-defined outward-facing scarp of Tertiary limestone, known as the Falaise de l'Île de France. This is pierced by a number of rivers, Oise, Aisne, Vesle, Marne, Seine, which afford easy routes converging towards Paris and which are now followed by the railways.

Apart from Paris there are no large towns in the region. This is true also for almost the whole of the basin, and though it is partly a natural result of the agricultural nature of the lowland, it is due also to the centralising policy which has been carried out for over three hundred years. The speed of railway transport has also aided this centralisation in modern times, since it takes only three hours by train to go from Paris as far as the borders of the basin in any direction.

Paris. Paris grew up at a crossing-place of the Seine where a small island first gave protection and afterwards facilitated the building of bridges. Before the days of big ships, sea-going vessels could come up river as far as this bridge, and even to-day Paris is still a great port, though goods now come in barges. The large extent, the fertility and diversity of the surrounding country have already been emphasised, and the nodal position, with routes converging from all directions, has been suggested. The site was sufficiently favourable to attract settlers in pre-Roman times, but the city did not become the centre of administration of Gaul under the Romans, who preferred Lyons, since the latter was better situated from the point of view of external administrators, who were also concerned with communications leading to Rome and to the Rhine frontier. Paris, in fact, owes its supremacy among French cities largely to the Capet kings, who in the twelfth century chose the town as their capital. The city grew as their rule was extended from the region between Paris and Orleans over all the country which is now called France, but which took its name from the land in the immediate neighbourhood of Paris. In particular, the highly centralising policy of the French kings, especially from the seventeenth century onwards, added to the size and prestige of the city, and the large numbers of nobles and officials assembled there led to the development of a number of industries, of which the luxury trades became world famous.

[Paris is to-day not only the supreme administrative centre of a highly centralised country, the chief commercial, intellectual, and

artistic centre, but is also actually the largest industrial centre, with as many industrial workers as the coalfields of the "Nord" and the silk-manufacturing region of Lyons combined. It has long been supreme in the designing and manufacture of women's clothing and of all manner of "articles de luxe" or "articles de Paris." In addition it has long been renowned for the elegance of its furniture and for interior decoration generally, though in this branch it has been rivalled and perhaps surpassed in the twentieth century by other countries. Many other kinds of building industries are also represented in Paris. It possesses also a great variety of manufactures needing skilled labour and comparatively small amounts of raw material, such as scientific and musical instruments, jewellery, motor cars, aeroplanes, electrical and light metal industries, as well as rolling-stock and river craft. Lastly, there are many industries which were established to work up the agricultural produce of the surrounding country for the dense population of the city, such as flour-milling, sugar and jam manufacturing, brewing, the making of shoes, and so on. It may here be noted that many of the other great capitals of Europe, such as London, Berlin, Vienna, and Stockholm, have similar manufactures, and also that Paris is no longer unique as a purveyor of elegance, the rise in the standard of education in western Europe having resulted also in an improvement in taste, and the demand for clothes, furniture, and decoration of good design at a cheap price has been met by the establishment of these industries in many countries.

Paris still holds an important position as an educational centre. Throughout the later Middle Ages and almost down to modern times it was the leading university city of Europe, and attracted large numbers of foreign students, particularly from South America and from such countries of east-central Europe as Rumania and Poland, but the devotion to letters (arts) and the comparative neglect of natural philosophy (science), caused Paris to lose ground in favour of universities in England, Switzerland, and Germany between 1918 and 1939.

Like the other great capital cities of Europe, Paris draws the gifted and ambitious from all over the country, but to an even greater degree, so that the provinces lack the active mental life to be found in, say, England and Germany. Even so, however, the city has been surpassed in size by London and Berlin, as well as by New York, its population being 2,725,000 at the Census of 1946, though "greater" Paris had a population of 5½ million.

The Paris Basin. (ii) *The Scarplands of Champagne and Burgundy.* East of the Falaise de l'Île de France there are a number of concentric scarps with expanses of plain and plateau between them

(see Fig. 45). From beneath the Tertiaries of the Falaise comes an outcrop of chalk which forms a stretch of dry country known in its central area as "La Champagne Pouilleuse," meaning "poor or barren Champagne," the word "champagne" being applied to many dry, level, treeless areas in different parts of France. This rises gradually towards the east only to fall by means of a scarp to the clays of "La Champagne Humide," from beneath which permeable rocks again emerge to form the Argonne Heights, formed of Lower Cretaceous sandstone, while farther south emerges the Côte des Bars, a scarp of Corallian limestone of Jurassic age. To the east of the Argonne rise the plateaus and scarps of Lorraine, while to the south-east of the Côte des Bars rises the plateau of Burgundy, usually called the Plateau de Langres.

La Champagne Pouilleuse, with its extension northwards to the *Pays de l'Aisne*, extends for some thirty-five miles from east to west and twice that distance from north to south. The region has a marked individuality. In general, there is an absence of superficial deposits, and the chalk by itself provides a poor, thin soil, for centuries devoted to sheep rearing, but during the nineteenth century partly put under cereals or afforested with pine trees. It corresponds to the English Salisbury Plain and is similarly used for army manœuvres. The open ground also provided a noted route-way from north to south in the pre-railway era, and was crossed by the east-west routes utilising river gaps in the scarps. Noted mediæval fairs were held at Troyes and Rheims. The famous Champagne wine comes from the narrow Tertiary scarp of the Falaise. As Champagne is near the northern margin of wine-production (c. 49° N.), the vineyards need a warm soil and a southern exposure, but the excellence of the wine produced seems due not only to natural conditions, but also to the excellent technique employed in its manufacture. The wine is largely exported. Rheims (111,000)¹ is the great organising centre of the industry, followed by Epernay on the Marne. Both are gap towns. The only other town of any size is Troyes (59,000), an isolated textile-manufacturing town, specialising in hosiery and knitted goods, an industry originally based on wool from local sheep.

The Plateau de Langres forms a threshold of rather high, scantily-peopled country between the lowlands of the Paris Basin and those of the Saône. In general the plateau is over 1,000 feet above sea-level. The Jurassic limestone here reaches a great thickness and there is little surface water except in the valleys, which deeply dissect the plateau and allow canals, roads, and railways to wind through the country. In some places the valleys cut down to the

¹ Population figures are from the 1946 Census

impermeable Liassic marls, and rich valley pastures result. The Oolitic limestone forms a scarp overlooking the Saône Valley, particularly towards the west, where it rises to more than 2,000 feet above sea-level and is known as the Côte d'Or.

The Paris Basin. (iii) *The Scarplands of Lorraine.* Structurally all the land west of the Vosges in Lorraine belongs to the Paris Basin, and consists of successive outcrops of Jurassic, Lias, and Triassic beds. Lorraine, however, differs in many ways from the rest of the basin. Apart from its rivers draining northward instead of westward, it is also higher, averaging between 900 and 1,000 feet, while the Côtes de Meuse reach over 1,300 feet. Consequently it is bleaker and wetter. The soils also are generally less fertile owing to the absence of *limon*, but the subsoil contains large deposits of minerals, particularly of iron.

The two main outcrops and scarps of Jurassic limestone are the Côtes de Meuse (Corallian) to the east of the River Meuse and the Côtes de Moselle (Oolitic) to the west of the River Moselle. These outcrops are both infertile zones of scanty population, mainly under forest. Between the two is the clay vale of the Woëvre, with fertile but heavy soils, while east of and overlooked by the 800-foot-high Côtes de Moselle is the largest area of low-lying and relatively fertile land in Lorraine. This lowland extends for over 100 miles from the Luxembourg lowland in the north to the low Mts. Faucilles in the south, and is developed on four types of rock, the Lias clay, the Keuper sandstones and marls, and the Muschelkalk, the latter being, as its name implies, a shelly limestone. Towards the south Muschelkalk forms the low hills of the Mts. Faucilles where the Saône rises, but farther north it does not form a perceptible scarp. This zone is succeeded eastward by the infertile and forested Bunter sandstone (*grès Vosgien*) which forms a hilly region bordering the crystalline Vosges and reaches to the Rhine rift itself farther north. Gaps through the scarps aided the construction of roads and railways from east to west, of which the route from Paris to Strasbourg *via* Toul and Nancy is the most important.

The main riches of Lorraine consist of great bodies of iron-ore which occur in the Lias and outcrop at the base of the Oolitic scarp of the Côtes de Moselle, from Nancy northwards to Longwy and across the Luxembourg-Belgium frontier. The deposits also extend under the Oolitic plateau and are extensively mined in the region round Briey. This is the largest iron deposit in Europe and possibly the second largest in the world, being exceeded only by the Lake Superior ores in the United States of America. The deposits extend over a long narrow strip some seventy miles long by about twelve miles wide, and the reserves at a modest estimate are

said to amount to 4,800,000,000 tons in the French section alone, excluding those in Luxembourg and Belgium. In spite of the vast quantities of ore, the deposits were almost entirely neglected until the last quarter of the nineteenth century, for the ore is phosphoric and under the older processes of smelting it produced a brittle iron of very poor quality. The first great impetus was the invention of the Thomas and Gilchrist basic process of smelting in 1879, and the second was the discovery in 1884 of the vast Briey deposits underlying the oolitic plateau.

PRODUCTION OF IRON-ORE IN LORRAINE. MILLION METRIC TONS

| Mining Area | 1928 | 1931 | 1932 | 1937 |
|-------------------------|-------|-------|-------|-------|
| Metz-Thionville | 20 40 | 20-24 | 11 63 | 15-63 |
| Briey-Longwy | 21 66 | 24-35 | 19 55 | 18-79 |
| Nancy | 1 50 | 1 41 | 0 64 | 0 99 |
| Total Lorraine | 43 57 | 46 00 | 32-82 | 35-41 |

The establishment of a large iron industry has been hindered by the absence of a large coalfield in the neighbourhood, the Sarre-Moselle coalfield having an output of only 18 million tons or so per annum (*see* pp. 278-279). There was also a pronounced shortage of labour not only for manufactures, but even for the mining itself, a shortage partly met by the importation of Polish and other foreign labour. The political vicissitudes of Lorraine also have not helped in its industrial development. Nancy (113,000) is the only town of over 100,000 inhabitants in the whole region, and it has the advantages of being an old-established town with a nodal position, as well as being the commercial centre for the iron industry and possessing metallurgical works in the vicinity.

On the eastern border of Lorraine, cotton manufacturing is carried on in a number of small, scattered towns of which the chief is Épinal. This cotton industry is an offshoot from the Alsatian and was originally dependent upon water-power provided by the streams from the Vosges.

The Paris Basin. (iv) *The South-West, or the Middle Loire Region.* This region lacks the symmetry of the east of the Paris Basin, mainly on account of the widespread Tertiary deposits, patches of which lie unconformably even on the Jurassic measures. There are no well-marked scarps and the region forms a great plain drained by the Loire and its tributaries, which flow between wide low terraces

in valleys slightly below the general level. The actual flood plain is usually sandy, but the old flood plain (which now forms the accompanying terraces), and the valley sides, are regions of intensive cultivation. On the other hand, the interfluves are only of moderate fertility and tend to be dry, either when they are developed on the Tertiary and Cretaceous sands or on the Cretaceous and Jurassic limestone. The Tertiary sands, clays, and gravels of La Sologne were probably deposited by a large river which in Miocene times flowed northwards from the Massif Central. They are among the poorest and most thinly peopled lands of France.

The valley of the middle Loire itself (known under various local names, such as the Val de Loire, Val d'Orléans, Val de Blois, Val de Touraine, Val d'Anjou), the lower valleys of the Cher, Indre, and Vienne on the south of the Loire, and the valley of the Sarthe on the north, resemble each other in their rich agricultural development, with noted vineyards, orchards, and poultry rearing. Touraine, in particular, with its concentration of converging valleys, has long been celebrated as the "Garden of France," the chief agricultural fair of France being held annually at Tours. The large number of fine old castles, particularly between Orléans and Anjou, which have earned for the middle Loire region the name of "château country" and a certain popularity as a tourist resort, are to some extent an indication of the long-continued agricultural wealth of the region and also of its popularity with the kings of France.

The intervening sandy plains retain considerable stretches of the woodlands and heaths in which the kings of France delighted to hunt, but they were mainly brought under cultivation in the eighteenth and early nineteenth centuries. On the Jurassic limestones of Berry, however, the bare treeless plain of La Champagne Berriçonne, between the Indre and Loire, resembles La Champagne Pouilleuse, and for centuries was devoted to sheep, and later also to cereals. To the north of Berry, in the great bend of the Loire, lies La Sologne, on whose flat surface water stagnated and produced marshes and lakes, partially reclaimed in the nineteenth century, though even to-day large numbers of small lakes remain as haunts of wild fowl.

There are no large towns in the south-western part of the Paris Basin, though many of medium size and of historical and architectural interest, such as Orléans (70,000), Tours (80,000), Angers (94,000), Le Mans (100,000). The region is of considerable historical importance as its possession aided the Capet kings of France to expand into the basin of Aquitaine, the second great lowland of the country.

The threshold known as Le Seuil de Poitou is much lower than that leading from the Paris Basin to the Upper Saône. In fact, it forms no break in the agricultural plain and has the same alternation of rich valleys (here reaching down to the Lias clay and providing good fattening pastures), with intervening stretches of drier lands, which though often only of medium fertility, contrast with the ungrateful lands of the old crystalline massifs to east and west.

The Region of the Lower Loire. In its lower course the River Loire flows across the old rocks at the southern end of the Armorican Massif. The region, known as La Vendée south of the river, is an old peneplain of low relief, and unlike the Paris Basin, its rocks are infertile, being composed of crystalline schists, granulites, and granites, and they are generally devoted to pasture, woods, and moorland. The valley of the River Loire forms a narrow ribbon of fertility across this area, and at its mouth is the considerable port of Nantes (200,000) and its outport of Saint Nazaire.

The position is not so advantageous as the site near the mouth of the longest river of France would suggest, for the purely agricultural character of the hinterland, whether the Armorican peneplain or the south-west of the Paris Basin, provides neither a large market for imports nor produces goods which are exported abroad. Nantes, however, imports "colonial" products such as cocoa, sugar, rice, palm-oil, etc., and has established factories to work them up, and also metallurgical works using imported coal. A ship canal has been built, permitting vessels of 21-feet draught to reach the port. St. Nazaire acts as an outport besides possessing the chief shipbuilding yards of France. Above Nantes the river is practically unnavigable as it suffers alternately from too little and too much water, for its upper basin and feeding area in the Massif Central consists mainly of impermeable rock, with a consequent quick run-off; moreover, the floods bring down large quantities of granitic sand which form troublesome sand-banks at low water.

The Paris Basin. (v) *The Coastal Regions of Normandy and Picardy.* This is the most thickly populated part of the basin apart from the central region immediately round Paris. The region is mainly developed on chalk, apart from the western section bordering the Armorican Massif where Jurassic limestone and marls appear, but both chalk and limestone are generally covered with superficial deposits of clay-with-flints (mainly to the west of the Seine), and *limon* (mainly to the east of the Seine). Moreover, the region benefits from its long sea border on the English Channel, for although the coast possesses only one great port, Le Havre, where the Seine estuary provides a good harbour, yet it has a number of

smaller ports, fishing towns, and holiday resorts. Some of the towns, *e.g.* Dieppe, Boulogne, combine all three functions. The central part of the region also benefits from being crossed by the most useful river in France, and the north-eastern part from being near the main coalfield of the country.

East of the Cotentin Peninsula, which belongs to the Armorican Massif, the little-disturbed sedimentary rocks of the Paris Basin begin with the Jurassic measures, followed eastward by a narrow strip of Liassic marls. Both of these give rise to *bocage* country (*see* p. 161), similar to that of the adjacent Armorican Massif. The *limon*-covered limestones of the Campagne de Caen, whose dry soils offer one of the most favourable sites for cereals in Normandy, provide a quite exceptional stretch of hedgeless "champagne" country. The port of Caen (51,000) itself is linked by the canalised River Orne to the sea and exports the agricultural products of Normandy (butter, eggs, vegetables) towards England, and of late years also the iron-ore recently discovered here in the Silurian measures. The annual output of ore is about $1\frac{1}{2}$ million tons.

Between the Campagne de Caen and the Seine are a number of *pays* which, though developed on chalk, have rich, humid soils, owing partly to superficial deposits of clay-with-flints, as in Lieuvin, and partly to the development of broad, alluvial valleys, as in the Pays d'Auge. The latter, with its valleys of the Touques, Dives, etc., is the richest producer of cider and cheese (*e.g.* Camembert) even in Normandy, which is famous for these commodities. In the Collines de Perche, on the south, an anticline of Cretaceous sandstone forms one of the few features of marked relief to be found in the western part of the Paris Basin. With a good deal of superficial clay, it is *bocage* country, with meadows devoted to the rearing of cattle and horses.

East of the Seine the deposits of *limon* covering the chalk in the Pays de Caux provide a good soil for wheat and sugar-beet, and agriculture approximates to that of Picardy (Fr., *Picardie*), but the Vexin Normand south-east of Rouen with less *limon* has more diverse farming.

The old historical name of Picardie is still often applied to the northern part of the Paris Basin on either side of the Somme. This region is traversed by a number of gentle anticlines and synclines running from north-west to south-east, of which the chief are the denuded anticline of Bray, which borders the region on the south-west, the syncline of the Somme-Avre Valley, and the anticline of Artois, which borders it on the north-east and which is denuded in the west to form the Boulonnais. The denuded anticlines disclose sands and clays below chalk and are moist lands suitable

for cattle-pasture, but the rest of the area is essentially an undulating lowland of *limon*-covered chalk. Patches of clay-with-flints and the presence of four wide, marshy valleys rescue the region from the monotony of, say, La Beauce, but there is a marked devotion to arable farming, particularly for wheat and beet-sugar, and in connection with the by-products of the latter, supplemented by forage crops, there is an important cattle-rearing industry which during the last fifty years has taken the place of the former sheep-rearing. The valleys in general are waterless, as in all the chalk country, but a few rivers still maintain their way, in spite of the lowered water-table. Of these the most important is the Somme, whose marshes formerly served as a marked obstacle to movement from east to west, but have largely been reclaimed and devoted to market-gardening. The old towns of Amiens (85,000) on the Somme and St. Quentin farther east on the old route between Flanders and Paris, both have isolated textile industries, originally working the local wool, now mainly cotton, jute, and linen. Numerous sugar crushing and refining mills are to be found in the countryside.

The Coast. The English Channel was formed in geologically recent times, probably round about 5,000 B.C. Previously its site had been occupied by the valley of a large river, which was fed by tributaries both from England and France, and which rose presumably in the Wealden-Artois anticline and flowed south-westwards. When the marine invasion started, cliffs began to form and the remains of truncated tributary valleys may be seen along them, e.g. between Tréport and Ault. Since then oscillations of level have occurred, but generally the coast is cliff-edged, with gaps where the rivers reach the sea. Along the Picardie coast, however, the change in direction from east-west to north-south allowed the building of sand-spits (*cordons littoraux*) with material derived from the cliffs of La Caux, so that between the sand-spits and the old cliff-edged coast lagoons were formed, which silted up and formed first marshes, and later with the aid of man were turned into dry land. The whole coast is thus generally inhospitable, apart from the estuaries, and these in their narrow chalk valleys are, with the exception of the Seine, too small for large vessels, even the small cross-Channel steamers having to be backed in to Boulogne as they cannot be turned in the narrow harbour. Boulogne (79,000) and Fécamp are the most important fishing ports, the former and Dieppe being noted packet stations. Numerous holiday resorts have developed owing to the proximity of Paris and of the dense population of the industrial north. Among these may be mentioned Deauville and Trouville to the west of the Seine estuary, and Le Touquet and Boulogne to the east.

Only the Seine estuary affords entry to large vessels and in addition offers a way far inland. Le Havre (107,000) is a modern port developed to meet the growing size of ships, and the Seine is here bordered by a sufficient breadth of alluvium for docks to be excavated. In addition to its goods traffic it is also an important liner and passenger port, although menaced by the development of Cherbourg. It is second only to Marseille as regards tonnage, and has shipbuilding and various other industries. Rouen (108,000) is the old historic port of the Paris Basin, and is situated at the lowest bridging point, but although on tide water it is about ninety miles up the tortuous incised meanders of the river and vessels drawing more than 18 feet cannot reach the port. It is the chief coal and oil importing port of France and the place of transshipment to the Seine barges. It also imports goods for its own industries, particularly the cotton textile industry and shipbuilding.

The North-Eastern Industrial Region. The low anticline of Artois, generally less than 600 feet high, forms no break between the Paris Basin and the similar Belgian Basin on the north-east. There is the same concentration on sugar-beet, wheat, and stall-fed cattle on the same *limon*-covered chalk, while farther north in Flanders are moister soils on which hops, flax, and other crops are added.

In the midst of this land of old-established, rich agriculture, the discovery of Coal Measures below the Cretaceous rocks led to the establishment in the nineteenth century of a large industrial district. The coalfield stretches from west to east in a narrow band, some six to ten miles wide, on the north of the Collines d'Artois, and extends eastwards across the Belgian frontier. It is thickly built upon by small mining and manufacturing towns which form a great industrial conurbation, with occasional centres of importance, such as Douai and Valenciennes. A considerable iron and steel industry has grown up here, including the manufacture of steam-engines and locomotives, but the principal industry is the textile, which is centred just north of the coalfield. This industry is an ancient one, originally based on the wool from sheep on the neighbouring chalk lands and from the Ardennes, and on the local flax for whose preparation the waters of the Lys have been famed since the Middle Ages. The old towns took a new lease of life with the discovery of the coalfield and new towns sprang up, so that there is now a large conurbation of over 730,000 people, with Lille (189,000), Roubaix (101,000), and Tourcoing (76,000) as nuclei, all occupied in the woollen, linen, and cotton industries. Armentières on the Lys specialises in linen. In addition to these industries there are important, though scattered, alimentary industries, preparing sugar, beer, butter, cheese, and chicory.

The region possesses an intricate system of canals, still in great use for carrying the bulky raw materials, coal, iron-ore, wool, and cotton, to and from the coalfield, and linked to the coast at Calais (50,000), Gravelines, and Dunkirk (Fr., Dunkerque). The latter, which is the chief port for the region, is an artificial creation.

The Armorican Massif. The Armorican Massif is a low dissected peneplain never exceeding 1,400 feet in height and generally below 600 feet. The region consists of Pre-Cambrian and Palæozoic rocks which have undergone two periods of folding, the first of which affected the Pre-Cambrian rocks and the second all rocks up to the late Palæozoic measures. It seems that this area was never a highly contorted mountain mass such as the Alps, but experienced less intense folding, similar to that of the French and Swiss Jura. Consequently metamorphism was less intense, and many rocks, especially the shales, retain their original character. These shales form the lower ground, the higher ground generally being formed of granites and of hard metamorphic rock such as gneisses and quartzitic sandstones. In general, the relief bears little relation to the structure, and although the higher land follows the direction of the strike, which is from east to west in the north and from south-east to north-west in the south, yet it corresponds to the harder rocks and not to one particular formation, nor to either anticlines or synclines. There are two main areas of broad uplands, the northern running eastwards from the Mts. d'Arrée (1,283 feet) in western Brittany to the hills of Alençon (1,368 feet), and a southerly line running parallel with the south coast to the Gâtine Hills of La Vendée, south of the Loire. Both uplands have many gaps, the southern line especially being discontinuous as well as seldom reaching above 600 feet. The land falls gently to the coastal and the interior lowlands on either hand, except in the west of Brittany, where the Montagnes Noires (1,069 feet) interpose a third zone of upland.

The Armorican Massif has often been compared to the south-western peninsula of England, although the latter is very much smaller, but in physiography, land utilisation, climate, distribution of the population, in fact both in landscape and mode of life there are strong resemblances between "L'Ouest" of France and the West of England. Both show rocky coasts, drowned estuaries, incised valleys, and low but accidented relief. The explanation is the same in both cases. After peneplanation both were partially submerged, but re-elevation brought about rejuvenation of the river systems with the result that the valleys, especially near the coast, are deep and narrow. Later submergence gave a drowned coastline. In climate also the two regions are similar. With their large

number of rain-days and their mild winters, grass scarcely stops growing, cattle- and horse-rearing is favoured, while early spring vegetables and flowers do well near the coasts. Like Devon and Cornwall also, the area is a country of meadows, mixed cultivation, orchards, and woodland in the lower lands, and of moors on the granites and on the higher regions generally.

The French apply the term *bocage* to the interior of the Armorican Massif, e.g. the "Bocage Normand" east of the Breton basin of Rennes, and the "Bocage Vendéen" south of the Loire. The *bocage* type of country is not densely wooded, in spite of the term meaning wooded or shrubby. It actually carries little timber in solid stands, but it rather resembles a landscape in Devon or south-west Wales (e.g. Cardigan or Carmarthen) with scattered trees and many hedgerows. The characteristic hedgerows are found nowhere else in France outside "L'Ouest," but are exactly like those of Devon and parts of Wales, and consist of earthy banks, sometimes supported with stones, and overgrown with vegetation. The soils are generally impermeable, water is abundant, and the population is disseminated in small hamlets and isolated farms. There are few towns of any size.

The eastern edge of the Armorican Massif runs from Falaise (near Caen in Normandy) *via* Argentan, Alençon to Angers, and this edge is marked by a fertile depression forming an important line of communication. The *bocage* type of country, however, is continued eastward beyond this margin on to the western part of the Paris basin, where impermeable clay-with-flints often overlie Cretaceous and Jurassic strata.

The Armorican Massif falls into four sections, the western peninsula or Brittany, the northern Cotentin peninsula in the old province of Normandy, the Bocage Normand and Bas Maine east of the Rennes basin, and the lands round the mouth of the Loire which include La Vendée. Brittany in particular shows a well-marked individuality, with its Celtic language, which is similar to Welsh, and its aloofness from the rest of France. The general poverty of the soil would suggest a scanty population, but, on the contrary, the density is above the average for France, though the coastlands (Ar Mor—"the land of the sea") are much more thickly populated than the interior (Argoat—"the land of the woods"), with 400-500 per square mile as against 100-150 in the *bocage*. The coastlands have the benefit of a milder climate and earlier spring for growing early vegetables, of cheap sea manures (seaweeds and crushed shells), and of greater opportunities for attracting tourists, in addition to their old fishing industries. The fisheries are mainly inshore on both coasts, but are otherwise different, the

southern coast specialising in the sardine and tunny fishery, including the canning of the fish in numbers of factories along the coast. The waters of the northern coast are generally too cold for sardines and the catch is various (turbot, conger, ray, mullet), while the fisherman and his family, in addition, usually cultivate a small plot of land. Paimpol specialises in lobsters, and like Binic and St. Malo sends ships to the Iceland and Newfoundland fisheries. The development of the early-vegetable industry was in response to the demand for such commodities from England, hence also the greater attention to this branch of agriculture on the north instead of on the milder south coast.

The interior of Brittany and also the southern coastlands have developed an important dairying industry, for which the interior basin of Châteaulin is especially noteworthy. Forage crops, to supplement the grass, are now being widely grown instead of the buckwheat and rye which were needed for human consumption in the days before the railway era, when Brittany was obliged to be economically self-contained.

There are few large towns in Brittany. Brest (75,000) is of national importance owing to its naval dockyards, but, although possessing a magnificent harbour, it has not developed as a commercial port for various reasons, including the lack of industrial concentration in the hinterland, and the slowness of the railway journey across the dissected Armorican Massif. Rennes (114,000), the former capital, in a fertile basin on the eastern edge of Brittany, is an important route centre, the crossing point of road and rail from Paris to Brest with those from St. Malo to the mouth of the Loire; it is also the chief commercial centre and the only university town. Lorient (about 46,000), on the southern coast of Brittany, is ranked second or third among French fishing ports, though its naval station has declined in importance.

The Cotentin peninsula of Normandy resembles Brittany for the most part, but the neck of the peninsula round Carentan lies in a synclinal depression, which is flat and marshy, though dyking and drainage have reclaimed the land for cultivation. The change in the direction of the coast, from a generalised east-west line in northern Brittany to a north-south in the western Cotentin, has caused the partial silting of the bay of St. Michel and the development of marshes along the west coast. These are absent from the short north coast, however, and during the twentieth century the port of Cherbourg has developed as one of the chief liner ports of France.

The Bocage Normand is typical *bocage* country developed on a dissected peneplain of old rocks, with flat-topped granitic uplands

rising to over 1,000 feet. The typical occupation is the rearing of horses and cattle, the latter being sent away for fattening. Bas Maine, to the south, is rather similar country, but is lower and threaded by the Mayenne valley.

The Basin of Aquitaine (Le Bassin Aquitain). The basin of Aquitaine forms a great triangular plain, bordered by the Pyrenees on the south, the Massif Central on the north-east, and the sea on the west, but connected by means of broad lowland corridors to the Paris basin and the Mediterranean coast. It is almost entirely agricultural, and has less variety of climate, hydrography, and soils than the Paris basin.

There is a much greater proportion of Tertiary deposits here than in the Paris basin. They reach to the coast on the west and to the Pyrenean folds on the south and continue also through the gate of Carcassonne into the lowlands of Languedoc. On the east the Tertiaries abut on to the old Silurian and granitic rocks of the south-western part of the Massif Central, and it is only in the north-east of the basin that the Cretaceous measures are found, stretching from the coast (Ile d'Oléron) south-eastwards nearly to the River Lot north of Cahors, while the Jurassic measures lie still farther to the north-east in a band stretching from the coast (Ile de Ré) south-eastwards to the River Aveyron. The Cretaceous measures are mainly, and the Jurassic measures almost wholly, formed of limestone, but the Tertiaries, unlike those of the Paris basin, mainly consist of clays and marls. The Cretaceous and Jurassic outcrops together form a belt of dry land on the north-east of the basin, while the Tertiaries have plenty of water and are generally more productive and more thickly peopled.

There are two exceptions, however, to the fertility of the Tertiary region, both occurring on the outer margins of the outcrop, namely the regions of the Lannemezan on the south and of the Landes on the west bordering the Bay of Biscay. In the first case the Tertiary rocks have been covered by immense fan-shaped scree (cônes de déjection) brought down in the Ice Age by glacial torrents from the high central Pyrenees. These thick deposits of gravel extend for fifty miles from south to north and have now been divided into isolated plateaus by feeders of the Garonne and Adour. These valleys become flooded with the summer torrents, while the plateaus themselves are high (c. 2,000 feet), dry, and bare and afford only sheep pasture. Population is very scanty and mainly confined to the valley sides, where maize forms the staple crop. The Landes region is a low, flat plain which has been invaded by wind-blown sand from the coastal dunes. The real mischief, however, is the presence at some depth of a band of impermeable rock (*alios*),

caused by the cementing of the sand by an iron oxide, aided by humic acids produced by the decomposition of roots and plants. This prevented the water in the subsoil escaping, and aggravated the lack of surface drainage which was caused by the level relief and by the fact that surface drainage is blocked seawards by a line of dunes, except for the Gulf of Arcachon. These dunes developed from a *cordon littoral*, which substituted a straight coastline for a former uneven one, the earlier bays becoming lagoons. In their original state the Landes were covered by dry, sandy stretches alternating with swamp, the former giving pasture to a few sheep. Reclamation in the nineteenth century took the form of planting and fixing the coastal dunes, cutting drainage canals, and planting the interior with pine woods, which now cover half the total area. The pine trees utilise the water of the subsoil, help to lower the water-table, and provide some humus, in addition to their valuable immediate use for turpentine and timber.

The central part of the basin, however, is a great zone of rich agriculture. This lowland is traversed by the main river of the basin, the Garonne, which almost monopolises the drainage, though the Adour drains the south-west corner. The whole of the Garonne plain is devoted to agriculture, noted as much for its variety as for its richness. Cereals, especially wheat and to a less extent maize, orchards, cattle-rearing, and vineyards all flourish. Along the Garonne estuary, however, the cultivation of vines is almost a monoculture, the wines, particularly those of Médoc and Graves on the west of the river, being of good quality and widely exported through Bordeaux. Bordeaux also *imports* considerable quantities of good wine from Languedoc, Algeria, and other places, and after suitable treatment these also acquire the name of "Bordeaux."

Bordeaux (254,000) is the largest town of the basin and of ancient fame as a wine-exporting city. It is an old bridge town situated on tide-water sixty miles up the river on the left bank of the Garonne, the right bank being mainly composed of cliffs. Like the other ports of the western coast of France (La Rochelle, Nantes), it may be compared with our own port of Bristol, since it reached its apogee at the time of the great sugar, rum, and slave trade with the Gulf of Mexico before the nineteenth century, and then declined relatively owing to the absence of an industrial hinterland. Its recent revival is due to the attention given to the South American and West African trade, particularly the imports of wool and meat from the former and groundnuts from the latter. Besides wine, the chief export consists of pit props from the Landes. Pauillac has been developed as an outport and work has been begun at Verdon, just inside the Gironde estuary, on a new deep-water and liner port.

Also situated on the Garonne is the city of Toulouse. It should be noted that the basin of Aquitaine has no natural centre and that the two most important towns are on the margins. Toulouse (264,000) is an ancient political and intellectual centre of southern France, and possesses a large university. In recent years, largely with the help of water-power, it has developed iron and woollen industries, the iron-ore being obtained from the Pyrenees. Toulouse and its neighbourhood form the only manufacturing region in the whole of the basin of Aquitaine.

To the north-east of the fertile Tertiary deposits are a number of "pays" which are transitional to the Massif Central. Between the River Vézère and the River Aveyron on the Jurassic limestone are the karst-like plateaus, or Causses, of Quercy (1,300–2,000 feet). These plateaus are devoted almost exclusively to sheep-rearing, Rocamadour cheese being made from the milk. The deep, sheltered valleys, however, with their alluvium form rich, if limited, agricultural land, devoted to maize, vines, and other fruits. Périgord, on the Cretaceous chalk, shows rather the same contrast between dry uplands and moist, productive valleys, but the uplands are lower (c. 600–700 feet) and are partly cultivated, partly under sheep pasture, and partly under oak forest, in which the famous truffles (a subterranean fungus) are found. Its prehistoric "grottoes" of Cro-Magnon, La Madeleine, and Le Moustier along the River Vézère are caves and holes in the chalk.

North-west of Périgord the "pays" of La Petite Champagne reveals its character in its name and is typical of the plains that accompany the River Charente from Angoulême westwards. The sides of the valley, however, produce excellent wines, which are made into brandy, named "cognac" after a small town on the river.

The Central Plateau (Le Massif Central). This high triangular-shaped horst is not as centrally placed as its name implies, and being entirely surrounded by lower lands it forms less of an obstacle to movement than one might think at first sight. It attains an average height of about 3,000 feet, with an extreme elevation of a little over 6,000 feet. But the massif, though rather scantily populated in parts, especially in the south, is by no means devoid of resources. It is deeply penetrated by the two tectonic depressions of the Allier and Upper Loire in the north, it possesses some mineral resources in a number of small coal basins, and even the plateau itself was long ago cleared of forest to provide pasture, and, in places, arable land.

The rocks of the massif were folded in early Carboniferous times, the strike being north-west to south-east in the western half and

north-east to south-west in the eastern half. The whole region proceeded to undergo the denudation which resulted in its reduction to a peneplain. In this peneplain granites and crystalline schists predominated, and the coal measures, which had been deposited in lake-filled synclines after the folding had taken place, were in some cases preserved. It should be noted that the coal measures were never very extensive, and that they were subsequently often disturbed by volcanic intrusions, by lateral compression which threw them into folds, and by later faulting. Small wonder, then, that the coalfields of the Massif Central are small and the coal expensive to work. The Mesozoic era was a period of calm during



Courtesy French National Tourist Office

FIG. 47.—THE BASIN OF LE PUY, ON THE UPPER LOIRE.

The volcanic “plug” on the left is surmounted by a church, that in the centre by a gigantic statue of the Virgin Mary.

which limestones were formed in the sea surrounding the island-massif, but in mid-Tertiary times the earth movements connected with the building of the Alps made their influence felt, and the massif was raised to a great height, especially in the south-east, where the high Cévennes Mountains now form the main watershed of the plateau. Included in this uplift were certain areas of Jurassic limestone, whose unfolded strata were raised *en bloc* to form the high plateaus of the Causses in the south and south-west of the massif. Extensive faulting also occurred, particularly in the north, where large segments of the plateau foundered and were covered by fresh-water lakes in the valleys of the Allier and Upper Loire. In connection with these lines of weakness was an active vulcanism,

which continued into Quaternary times and raised up volcanoes and spread lava plateaus over the centre of the massif. The highest point of the massif to-day is formed by one of these volcanoes, the Puy de Sancy (6,186 feet), and though the Tertiary volcanoes are considerably weathered, those of the Chaîne des Puys, of Quaternary date, are extraordinarily well-preserved. The older lava plateaus have been weathered sufficiently long to cause extensive decomposition and now provide the most fertile soils of the massif. Apart from the volcanoes and the foundered zones, the plateau still retains its peneplain appearance, with rounded outlines and large areas of flat or undulating ground. The uplift, however, naturally caused a rejuvenation of the river system, and, particularly in the south where the uplift was greatest, the larger rivers have formed deep, narrow, and wild valleys, e.g. the Tarn and Lot, while short torrential streams have fretted the south-eastern edges of the plateau into mountainous forms. On the other hand, the north-western part, which was little uplifted, retains its senile shallow valleys.

It can be seen from the above brief summary of its physical history that the massif is an area of considerable diversity, which is increased by differences in the relation of the various parts with the plains at their feet, and also by differences of climate, the southern border of the massif coming under the Mediterranean régime, and the whole of the western part being more oceanic than the eastern.

The massif can conveniently be divided into four sub-regions, (a) eastern, (b) central, (c) southern, (d) north-western.

(a) *The Eastern Part of the Massif*, bordering the great highway of the Rhône-Saône valley and lying east of the Upper Loire, consists of an alternation of highlands and depressions, all orientated from north-east to south-west in the direction of the strike. This means that the area was open to penetration from both sides, and through routes, utilised by road, railway, and canal, traverse the depressions. The mountain masses from the Morvan in the north to the Vivarais in the south are generally composed of granite, possess rounded forms, and are regions of much bog and poor agriculture, though cattle-rearing and some cultivation of hardy crops such as rye and buckwheat are carried on. Some patches of forest remain and the Vivarais still cultivates mulberry trees, though in decreasing quantities. The lower parts of the eastern slopes bordering the Saône-Rhône depression are devoted to vineyards, but north of Lyons these slopes are mainly formed of sediments belonging to the Saône basin, and do not strictly belong to the ancient massif. Population and activity are concentrated in the depressions of Le Creusot and St. Etienne, though industry has also invaded the

highlands round the latter town. Both these depressions possess small coal basins, the output from the former being *c.* $2\frac{1}{2}$ million tons a year, and from the latter $3\frac{1}{4}$ million tons. Le Creusot (about 38,000) was actually the first place in France to use coke in smelting iron, the first blast-furnace of that kind being set up in 1782 by an Englishman. The Canal du Centre, built shortly afterwards between the Saône and Loire, was of great value to the industry before the railway era, but in the absence of iron and the shortage and expense of the coal, the industry only keeps going owing to its historic momentum and to its safe position, remote from a frontier, for the manufacture of armaments. The same remarks are true for the St. Etienne iron industry, and though there is a less acute shortage of coal, yet without the restrictions on imports foreign coal could undersell the local product, and Cardiff coal did so in 1913 on these central coal-fields themselves. The industry survives by concentrating on products needing a small amount of raw materials but considerable skill and experience, such as cutlery, small arms, and special steels. St. Etienne (178,000),¹ however, has another industry, fostered by the silk merchants of Lyons, that of ribbon-making, formerly of silk alone, but now also of cotton and rayon. This industry has spread into the surrounding mountains, where it is often a home industry, though the looms are driven by hydro-electricity obtained from the Alps.

(b) *The Centre of the Massif* includes the great tectonic depressions of the Upper Loire and Allier, the associated volcanic areas, and parts of the old crystalline plateau on which the volcanic deposits rest. Along the Upper Loire are three tectonic basins, but only the most southerly one, that of Le Puy, has really fertile soil, since this basin alone is surrounded by Tertiary volcanic outpourings. The remains of these deposits, which once filled the whole basin of Le Puy, form isolated stacks—often picturesquely crowned by churches (*see* Fig. 47)—and the columnar basalt “organ pipes” of Espaly (*cf.* Fingal’s Cave, Staffa). The western part of the Allier depression also has fertile soil derived from the volcanic region of the Auvergne, but the eastern part, with soils from the crystalline Mts. du Forez, is less productive. Vichy on the eastern border is noted for its thermal springs. Clermont Ferrand (108,000) on the western border, the second largest town of the massif, uses fruits of the plain and milk of the mountains to manufacture jams and chocolate, and the initiative of its inhabitants has led to the establishment of rubber manufactures, particularly motor tyres, and of motor car factories. The volcanic region of the Auvergne

¹ The “conurbation” of St. Etienne, stretching along the depression, numbers about 350,000 people.

shows a great variety of volcanic forms in many stages of denudation. The Cantal and Mt. Dore are gigantic volcanoes eaten into by erosion, and the parts left upstanding are the actual *puy*s or peaks, of which the Puy de Sancy (6,186 feet) is the highest mountain of the whole Hercynian zone of Europe. North of Mt. Dore and



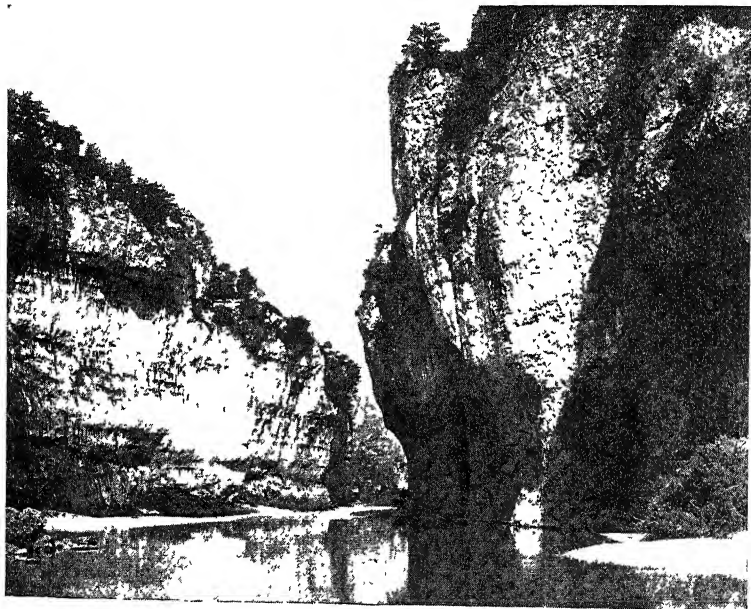
[Courtesy French National Tourist Office]

FIG. 48.—VIEW IN THE PLATEAU OF AUVERGNE FROM CHATEAU À MUROLS.

This view over high plateau pasture-lands, developed on volcanic soil, is typical of many in the "Mountains" of Auvergne.

immediately west of Clermont Ferrand is the extraordinary landscape of the Chaîne des Puys, with sixty or more volcanoes stretching as far as the eye can see, mostly with beautifully preserved craters and lava streams. But it is the old lava plateaus, known as *planèzes*, round the older volcanoes, which offer the good soil of the district, and these, though bleak, carry excellent pastures devoted to dairy cattle.

(c) *The Southern Part of the Massif* presents an alternation of crystalline and high limestone plateaus, which very seldom assume a mountainous appearance, apart from the Montagne Noire and the Cévennes on the southern margin. The limestone plateaus known as "Causses" are renowned for the deep, cañon-like valleys cut by the Rivers Lot, Tarn, and their tributaries. The plateaus themselves exhibit all the usual karstic phenomena, including dolines, swallow holes, and underground streams. Economically the Causses are poor, though the aromatic herbage nourishes flocks of sheep,



[Courtesy French National Tourist Office]

FIG. 49.—VIEW IN THE GREAT GORGE OF THE TARN.

sheep's milk cheese (Roquefort) being made in the valleys. Many transhumant sheep from the Mediterranean plain of Languedoc pass the summer here. The similar but lower Causses of Quercy have already been mentioned in connection with the basin of Aquitaine. The Alès coalfield on the south-east of the Cévennes has an annual output of about 2 million tons, and the Carmaux-Albi coalfield, to the west of the massif, about 800,000 tons.

(d) *The North-western Part of the Massif* presents the most uniform appearance. The whole of this plateau of Limousin and Marche is a crystalline peneplain with poor soils and few resources. The

higher parts of the plateau carry heath and some forest; the valleys are barely scooped out, are encumbered with alluvium, and are mainly swampy. Only sheep and store cattle can be reared and these with difficulty, but towards the borders, where the effect of the rejuvenation of the river system has been felt, the valleys have a greater slope and when drained give good pasture for cattle. Western Limousin, west of Limoges, is sufficiently low-lying and penetrated by wide valleys to be much warmer. Sweet chestnuts flourish and long afforded the staple food "crop" of the region. Limoges (108,000), noted for its porcelain made from china clay weathered from the local granite, is on the main route from Paris to Bordeaux, which here takes a short cut across the low north-western portion of the massif.

The Massif Central is one of the regions from which emigration to the richer parts of France has long taken place. A specialised form of this emigration was that of the famed companies of stonemasons who carried out work far afield in the Middle Ages; they built, for instance, the cathedral at Uppsala in Sweden in the twelfth century. At the present time there is some seasonal migration to the vintages of the surrounding lowlands, but the spread of the railways in the nineteenth century allowed the people to abandon subsistence farming and to concentrate on cattle-rearing, for which most of the region is best suited. A great improvement in stature and physique has been noted during the last sixty or seventy years.

The Rhône-Saône Depression and the Mediterranean Coast. This area of very varied relief consists of the Rhône-Saône corridor, the bordering mountains of the Alps and Jura on the east, and the Mediterranean coastlands of Provence to the east of the Rhône and of Languedoc to the west. The area may be looked upon as being mainly an elongated basin of sedimentation, with Tertiary deposits running from north to south down the long central axis, but the bordering Cretaceous and Jurassic measures on the east have been thrown into folds, while on the west their outcrop is not continuous, the Tertiaries in places coming directly against the old rocks of the Massif Central.

The Saône-Rhône corridor is particularly noted as a routeway from north to south and for the branch routes which strike off from it, though the waterway itself is neglected owing to the rapid flow of the Rhône, fed as it is from Alpine rivers, while the slow-moving Saône is used for local traffic only. Road and rail routes from the Paris basin and Lorraine converge across the Plateau de Langres to the head of the Saône depression, where the route from the Rhine rift valley (*via* the Belfort gap between the Vosges and Jura) also comes in. Important routes, though more difficult ones, lead

from the Saône valley across the Jura to the Swiss plateau and thence across the Alps to Italy, while farther south is the Lyons-Mt. Cenis-Turin route directly across the Alps. The importance of these routes in connecting the busy well-populated regions of north-west Europe with the Mediterranean lands has already been emphasised.

The Saône-Rhône corridor, however, is more than a mere route-way, for it has considerable agricultural importance and also contains the most important silk-manufacturing centre of Europe. Its agricultural importance is, however, limited by its narrowness. The Saône plain above Lyons is the widest part, the Tertiary lowlands extending here for some forty miles from east to west by 130 miles from north to south, whereas the Tertiaries of the Rhône valley, between Lyons and the defile of Donzère (south of Montélimar), have undergone considerable uplift and the present lowland consists of small basins alternating with narrows. This narrow picturesque section between Lyons and Donzère, with its accompanying old castles and little towns, though some eighty miles long, varies in width from about ten miles to practically nothing at all. Large dams and power stations are here being built and projected to tap the energy of the rapid, swirling river. Below the Donzère gorge the highlands recede from the river, leaving a triangular plain whose Mediterranean climate causes its agriculture to differ in some ways from that of the rest of the corridor. Throughout the region, however, hot summers and early springs greatly favour plant growth, and allow a rich and diverse agriculture in spite of the fact that the soils are by no means always fertile. The Tertiaries themselves are sandy in places, but the worst soil is probably produced by the morainic material brought down by the former glaciers of the Rhône and Isère which reached the Rhône valley just above and below Lyons during the great Ice Age. The marshes and lakes of La Dombes in the angle between the Saône and Rhône are developed on impermeable glacial clays.

The main agricultural wealth of the corridor lies in its vineyards, the most famous being those of the oolitic scarp of the Côte d'Or to the south-west of Dijon, where the renowned wines of Burgundy are produced, though indeed all the lower outer slopes of the Massif Central overlooking the river produce wines of good repute, and less esteemed wines come from the plain itself. Dijon (101,000), the old capital of Burgundy, is the organising centre of the industry and also possesses alimentary industries, including the making of wine and of beer. Its importance as a route centre has already been noted.

At the other end of the Saône lowland, situated at the junction of Saône and Rhône, is the great city of Lyons (Fr., Lyon; 461,000),

the third largest town in France. The city was made the capital of Gaul under the Romans owing to its nodal position at the convergence of the Rhône-Saône route with (a) the route between the Jura and the Alps leading to the Swiss plateau and (b) the routes westward across the narrow eastern highlands of the Massif Central to the Loire. Its modern importance is due to its silk industry and banking organisation, but a detailed study of the growth of both reveals how much they owe to artificial fostering on the part of the French kings from the fifteenth century onwards. The raw material for the silk industry at first came from Italy, the Levant, and Spain, but the cultivation of the white mulberry, on whose leaves the silk-worms are nourished, gradually spread in southern France from the fourteenth century onwards, although raw silk continued to be imported. In modern times the greater part of the raw silk has been imported from Japan and Italy, the rearing of silk-worms having languished in France owing to the small remuneration it offers in spite of a state bounty. The highly organised industry maintains its world reputation largely owing to the experience, skill, and taste of the people engaged in it, especially to their fertility in bringing out new designs. In amount of silk used, however, the French silk industry has been surpassed by the American. As already mentioned, the industry has spread into the neighbouring mountains, particularly those of the Massif Central.

The French Jura. Accompanying the Saône lowlands on the east is the highland region of the Jura, averaging some 3,000 feet and reaching to over 5,000 feet. This region presents the classic example of a simple type of folding, where practically every anticline forms a ridge and every syncline a depression, though it is only the eastern side, partly in Switzerland, which shows this type of country (*Jura plissé*), and in the central and north-western regions the rocks are unfolded though faulted, and plateaus have resulted (*Jura tabulaire*). A markedly individual river system has arisen in the folded portion, with sluggish longitudinal courses in the synclines and short rapid stretches where the rivers break through the anticlines in gorges (*cluses*). The alternation of ridges and valleys lends itself to a complicated system of river capture; the "incredible" course of the River Doubs with its abrupt hairpin bends presents one of the best examples of a river of this kind. Some of the longitudinal valleys have no apparent outlet, but drain away through the Jurassic limestone which forms the greater part of the mountain system. The synclines often retain Cretaceous deposits, sometimes even Tertiaries, which are usually clayey and retentive of moisture, while bands of clays in the Jurassic series cause

the occurrence of powerful springs. The Keuper marls of the Triassic system, sometimes brought to light in the denuded anticlines, and always present at depth, are also little permeable.

The Jura Mountains have a heavy precipitation and were originally mainly forested. Clearing has taken place wherever good pasture would result and the whole area has become an important dairying country, the cattle being turned on to the higher pastures in summer and stall-fed from the rich produce of the valley meadows in the winter. A good deal of forest still remains in the higher parts, and on the lower slopes, below 1,000 feet, vines are cultivated. Settlement is agglomerated in large villages and small towns, principally at the entrance of *chuses*, e.g. Pontarlier, Nantua, both on main international railway lines which insinuate themselves through the mountains along the synclines or cut in short tunnels through the anticlines. Besançon (64,000) on the Doubs, near its entrance to the Saône plain, is the main market town of the French Jura, and the main centre of the watch and clock industry, which is widely scattered in many small workshops in the Jura villages.

The French Alps of Savoy and Dauphiné. The Alps border the Rhône valley closely from Lyons southwards. Their outer folds (Préalpes), formed mainly of limestone, are known as autochthonous, in contrast to the transported material of the *nappes*, and have a north-south strike. (See Chapter XXIII.) They reach a height of over 6,000 feet, but are deeply penetrated by two great valleys, the Upper Rhône and the Isère. A good deal of river capture has taken place here, and before the Ice Age the Upper Rhône flowed northwards to Lake Geneva and along the depression between that lake and Lake Neuchâtel. Also the Isère, by cutting a deep longitudinal furrow in a band of soft Liassic rock, has beheaded the transverse valleys of the Lac du Bourget and the Lac d'Annecy, though the through routes remain, the former being used by the Paris-Mâcon-Mt. Cenis railway line. The Isère and Arc valleys provide narrow but fertile ribbons of agriculture almost into the heart of the Alps, and contain also a considerable industrial development especially for the manufacture of paper, aluminium, steel and ferro-alloys, and calcium carbide, using hydro-electricity. At present more hydro-electricity is developed from these rivers than from the Rhône, but the great new dam at Génissiat on the Rhône near Bellegarde will supply power to the largest generating station in France. Grenoble (102,000), at the junction of the Drac and Isère, is a route centre and a University town noted for its researches on hydro-electricity, and has considerable manufactures such as silk, gloves, paper.

The high inner French Alps which include the high crystalline massifs of Mont Blanc, Pelvoux, and Mercantour are little productive, but water-power is being further developed, and the fine scenery attracts large numbers of tourists.

The most widespread occupation of the Alps of Savoy (Fr., Savoie) and Dauphiné is the rearing of dairy cattle. There is also some forestry.

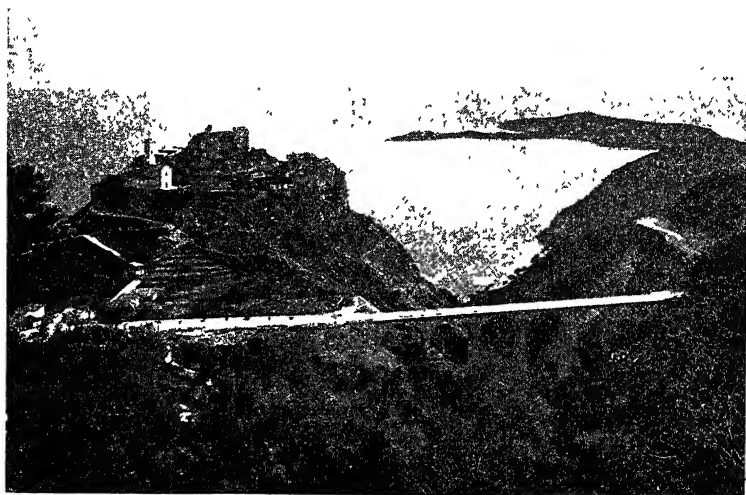
The Mediterranean Lands of France. South of the Montélimar gorge begins the Mediterranean coastal region. The Rhône itself forms a delta owing to the tidelessness of the Mediterranean Sea, and there is no suitable site for a great port actually at the entrance of the great Rhône-Saône corridor. Marseilles is twenty-five miles to the east of the delta, away from the river-silt which is carried westward by a coastal current.

The region of Mediterranean France has a unity of climate, but in relief and structure the area shows many contrasts, there being marked differences between Provence on the east of the Rhône and Bas Languedoc on the west. The latter is mainly a lowland, but the former is a complex region of folded mountains and old massifs, together with basins and valleys. In the Alps of Provence two sets of folds have come in conflict with one another. The main strike, especially in the west, is from west to east, *i.e.* the same as that of the Pyrenees, and it is considered that these folds are older than the Alpine folds, which here are from north to south, and that they interfered with the development of the latter. Peneplanation seems to have been carried to an advanced stage, and the subsequent re-elevation has produced a great development of plateau forms in the limestone of which the mountains are largely composed.

These east-west folds are also visible to the west of the mountain zone though they form only low ridges standing a few hundred feet above the surrounding Tertiary plains, as in the case of Les Alpilles, north-east of Arles. Everywhere, however, the dry climate and the permeability of the rock produce only a thin growth of thorny or resinous plants, so that the southern Alps, unlike the northern, are good for sheep pasture only, and even in the low ridges the bare white limestone gleams through the scanty vegetation. The consequent heavy weathering has given these hills a singularly rugged and mountainous appearance in spite of the low altitude.

The basins and plains to the east of the Rhône and north of the delta are highly cultivated, and often irrigated, mainly from the Durance. The cultures are extremely varied, but early vegetables have a considerable place, and are usually grown on the sunny side of thick cypress hedges, which are reinforced by bamboo fences, as a protection against the Mistral, a cold northerly wind which blows

in winter and spring. This wind, whose name means "The Masterful," is merely the usual cold north-west wind which blows at the back of a cyclone, but its coldness is here intensified by the contrast between the warmth of the Mediterranean coasts and the cold of the mountains, and the wind is especially strong because the narrow Rhône valley acts as a flue or funnel. The expression is often used locally for any rather strong wind regardless of its direction. Almonds, peaches, and other fruit trees are common,



[Courtesy P.L.M. Railway]

FIG. 50.—EZE AND THE CAP FERRAT, SEEN FROM THE GRANDE CORNICHE ROAD.

A typical piece of the Riviera coast. Note the village, perched on a hill for better defence in olden days, the terraced cultivation, and the obvious difficulty of constructing roads along the coast.

as well as vines. Avignon (60,000) is now mainly a centre for tourists who come for the sunshine and for the fine Roman and mediæval buildings of the Lower Rhône Valley. East of the main distributary of the Rhône is the region of La Crau, whose surface is covered with pebbles and boulders brought down by a former course of the Durance. According to the old saying: "Parlement, Mistral et Durance sont les trois fléaux de Provence." The dry surface is still largely devoted to winter pasture for sheep which in

summer are taken up to the Alps, but it has been partly reclaimed for olive growing and other cultivations.

Immediately east of La Crau rises the low chain of the Estaque, at the western end of the rocky coast of Provence. West of Toulon and east of Nice the limestone Alps reach to the coast, but between these are the two crystalline masses of the Maures and the Estérel, separated and bordered on the landward side by depressions of softer (Permian and Triassic) rocks, which afford opportunities for cultivation and movement. The valley of the River Arc with its Tertiary sediments continues the line of the Argens depression. The coast is rich in harbours, but Marseilles is the only commercial port, Toulon (150,000) being a naval base. The main resources of the Provençal coast are its sunshine and scenery and more particularly its accessibility to the people of north-western Europe, many parts of the Mediterranean coasts being equally endowed but suffering from remoteness. Cannes, Nice (211,000), Monte Carlo, Mentone, and many smaller centres are too well known to need comment.

West of the main distributary of the Rhône is the silt-formed delta known as the Camargue, a salty and marshy area devoted mainly to cattle pasture. The more northerly drier parts have been reclaimed for vineyards and other cultivations, including rice. The plain of Lower Languedoc consists of an alternation of Tertiary lowlands with low limestone hills known as *garrigues*, the former being chiefly devoted to vineyards, partly irrigated, and the latter to olives and winter pasture for sheep. Over half the French output of wine is produced here, but the quality is only ordinary as a rule. Nîmes (104,000) and Montpellier (93,000) are old centres near the junction of garrigues and plain. The coast is an entire contrast to that of Provence as it is edged by a dune-crowned "cordon littoral" behind which are lagoons, some of which have been drained for cultivation. Sète, formerly Cette, is a small artificial port, with a large export of wine.

Marseilles (Fr., Marseille; 636,000) is the leading passenger port of France, and the leading port as regards value of merchandise, though it stands second to Le Havre in tonnage. Founded by the ancient Greeks, the city long played an important rôle in Mediterranean trade, but its modern prosperity dates from the last quarter of the nineteenth century. The imports are of raw materials, largely from the Orient *via* the Suez Canal, from North and West Africa and South America, and include vegetable oil, fruits, cereals, wool, silk, cotton, rubber, sugar, coffee, and mineral oil. The exports are mainly of manufactured goods, including cotton and silk tissues, metal objects, vegetable oils, sugar, rubber goods. Considerable manufactures have grown up in the neighbourhood, including soap,

originally made from local olive oil, silk tissues, flour, sugar, and other products manufactured from the imported raw material.

A canal (10½ feet deep) connects Marseilles to the Rhône *via* the Etang de Berre. It pierces the Estaque in a tunnel 4¾ miles long, which was completed in 1927, and is part of a great scheme to improve the Rhône as a waterway. The sheltered waters of the Etang de Berre are bordered by a number of small ports, mainly developed since 1914, which handle a large tonnage of mineral oil, amounting to some three million tons in normal years. These ports, with plenty of level ground available, are complementary to the old port of Marseilles and are under the jurisdiction of the latter. Their industries include oil-refining and the manufacture of explosives and cement.

Economic Summary. Unlike her neighbours in western and central Europe, France aims at a balance of agriculture and industry rather than a dependence on industrial exports. Nevertheless, although rather more of her working population are engaged in agriculture and fisheries than in mining and industry (36 v. 35 per cent.), the total numbers engaged in industrial pursuits (about 7½ millions) place France third as an industrialist among European countries, or fourth if the U.S.S.R. is included. Her modern industrial development was largely due to the early start obtained in the Industrial Revolution, consequent upon her proximity to England, her accumulations of capital, fair supplies of coal, and relatively stable political organisation. At the present day France is hampered industrially by the fact that her supplies of coal are *only* mediocre in quantity and are expensive to mine. The output in 1950 was 51 million tons. France, with the Saar, consumed 70 million tons of which 4 million had to be imported. Iron ore however more than meets the needs of France and the Saar: of the 30 million tons produced in 1950, 30 per cent. was available for export. The export of pig-iron and steel was also considerable. With the Lorraine ores, France has been able to develop her iron industry very greatly, though in 1937 she held only fifth place as a world-producer of pig-iron instead of the second place she held in 1932, U.S.S.R., Germany, and Great Britain having surpassed her during that period, while the United States continued to hold first place. Of other minerals, France is also fortunate in possessing, in the Department of Var in the southern Alps, the world's greatest deposit of bauxite, a mineral from which aluminium is produced, and also possesses, in Alsace, very large deposits of potash salts, second only to those of Germany. The large amount of water-power available in the Alps, Pyrenees, and Central Massif is also a great and increasingly valuable asset, and amounts to *c.* one-half of the mechanical energy used in industry.

The main branches of the French manufacturing industry are the engineering and metallurgical, employing about $1\frac{1}{2}$ million people at the census of 1931, the textile and clothing, each employing about a million, the alimentary about half a million, and the chemical about 200,000.

The metallurgical and engineering industries are naturally mainly associated with the coalfields and iron deposits, with the exception of Paris, the ports, and the electro-metallurgical industries of the Alps and Pyrenees.

PRODUCTION OF MAIN FRENCH COALFIELDS, 1936

| | Million Tons |
|------------------------------|------------------|
| Nord and Pas de Calais . . . | 28.4 |
| Moselle | 5.4 |
| St. Etienne | 3.2 |
| Le Creusot | 2.4 |
| Alès | 2.1 |
| Others | 3.7 |
| Total . . . | <hr/> 45.2 <hr/> |

Three-quarters of the French output of pig-iron and steel are normally produced in Lorraine, and only one-quarter in the North-Eastern industrial region, but the latter is more important than Lorraine for engineering. Le Creusot and St. Etienne region have highly specialised metallurgical and engineering industries. In the Alps and Pyrenees there are numerous electric furnaces producing steel and ferro-alloys. In both the Lorraine and North-Eastern industrial regions dislocation has followed war three times within living memory.

French textile industries include cotton, silk, wool, rayon, and flax, with the first three being the most important. France stands supreme in Europe for the weaving of real silk, both in quantity and quality, and first in the world for quality. She ranked second before World War II as a European cotton manufacturer, though closely rivalled by Germany and later by U.S.S.R.

The heavy chemical industry is located chiefly (a) on the coalfields of the north-east; (b) in the Alps and Pyrenees, where hydro-electric power is utilised in the manufacture of calcium carbide and its derivatives; (c) in the ports, where petroleum is refined and fertilisers manufactured; and (d) in Lorraine, where salt is available and potash may be brought from Alsace. France stood third among European countries as a manufacturer of heavy chemicals, while French pharmaceutical products have long been well known all over the world, though they appeared to be losing ground of late years.

The alimentary industries are very scattered, and chiefly concerned with wine, spirits, cheese, sugar-refining, flour-milling, and confectionery. France is the most important wine-producing country of the world, for although Italy has a greater acreage under vineyards, the total yield is much larger in France, and the quality and variety of French wines is unsurpassed.

Agriculturally, France is almost self-sufficing in those foodstuffs which can be produced in temperate climates, and—with the aid of a protected home market—the country is one of Europe's chief producers of wheat, though the home requirements are not always covered. It is interesting to notice that although France is nearly twice the size of the British Isles (213,000 v. 122,000 square miles), yet the population is smaller in numbers (42 v. 53 million), and this in spite of the lower latitude and the larger proportion of the tillable land. There is no geographical reason why France should suffer from a shortage of food; but French agricultural methods urgently need bringing up to date.

Owing to her large agricultural output, France is less vitally dependent on foreign trade than, say, Great Britain, Belgium, or Holland, yet France ranked third among European countries in volume of trade between the two wars, and fourth in the world, only U.S.A., Great Britain, and Germany having a larger share. Her main branches of export were high quality manufactured goods and agricultural products, but certain semi-manufactured goods, such as pig-iron and steel, and raw materials, such as iron-ore, pit-props, and bauxite were not unimportant. Textiles generally held first place, followed by machinery, iron and steel, chemicals, wines and spirits, iron-ore, paper, and motor cars. The imports were mainly coal, raw materials for her textile industry, metals, *e.g.* copper, colonial produce, petroleum, and some engineering, and chemical products.

France had a considerable mercantile marine and between the two world wars made a bid to obtain a greater share of the world's passenger traffic. France stood seventh on the list as regards world shipping in 1937 and fifth in Europe, the total tonnage reaching 2,870,000 tons. Practically all her passenger liners were lost in the 1939–45 war, but the mercantile marine amounted to 1,266,000 tons in 1946.

The Decline of France as a Great Power. At the time of the Napoleonic Wars, France was, after Russia, the most populous country of Europe. About 1801, her population numbered some 27 million as against 11 million in Great Britain, 18 million in the Italian states, and 25 million in the German states. Moreover, the two latter groups of people could not make their numbers felt

because of their political disunity. This French superiority in numbers *vis-à-vis* her neighbours was maintained until the middle of the nineteenth century, but from 1870 to 1936 the total population increase in France was only 5 million, against 16 million in Italy, 20 million in the United Kingdom, and 28 million in Germany. The total population declined from 41,907,000 in 1936 to 40,519,000 in 1946.

The decline in the birth-rate during the late nineteenth and twentieth centuries was felt throughout north-western and west-central Europe, and was thus not confined to France, but it started earlier in that country and its results were felt more acutely there than elsewhere. The low French birth-rate was partly offset by the immigration of foreigners, chiefly Poles and Belgians in the industrial districts of the north-east, Italians in the south-east, and Spaniards in the south-west. About 3 million people of foreign extraction were living in France in 1936.

The large increases of population in many parts of the world (e.g. U.S.S.R. and U.S.A.), and the rise of industrialisation in new areas, have diminished the relative importance of all the historically powerful countries of western and central Europe, but France has felt this competition perhaps more acutely than any of the others.

REFERENCES

La France (3 vols.), by E. de Martonne and A. Demangeon (Paris, 1942, 1946 and 1948), Tome VI of the *Géographie Universelle*, is an authoritative study. P. Vidal de la Blache's *Tableau de la Géographie de la France* (Paris, 1908 and later editions) remains a classic work. *France*, by H. Ormsby (London, 1950), gives a very detailed regional account. Among smaller works are *France, a Geographical Introduction*, by E. Estyn Evans (London, 1937), and *Géographie de la France*, by L. Gallouédec and F. Maurette. The great *Atlas de France*, published in separate sheets from 1933 onwards, should be consulted. For a comprehensive series of photographs with explanatory text, see *France Métropole et Colonies*, by A. Demangeon, A. Cholley, and C. Robequain, in 26 volumes (Paris, 1938). See also, *French Life and its Problems*, by H. J. Fleure (1943).

CHAPTER XI

THE LOW COUNTRIES (BELGIUM, HOLLAND AND LUXEMBOURG—THE BENELUX GROUP)

BELGIUM and Holland have an interest and importance out of all proportion to their small size. The former, in the Middle Ages, showed the most precocious development of city life north of the Mediterranean zone, the earliest development of a great mediæval textile industry outside Mediterranean Europe, and later led the way in the Agricultural Revolution which spread over the Continent. It was the first country to follow England in the Industrial Revolution and to-day has great manufactures and the most intensive agriculture of the continent. Holland has long attracted interest by its unrelenting struggle with the sea, a quarter of its surface being actually below sea-level. This effort to create land where none existed before is still going on, and the great project of reclaiming the Zuider Zee has been partially carried out (*see* p. 195). Holland's overseas possessions in the East Indies are an important witness to the country's long continued overseas enterprise, though Belgium's valuable possessions in Africa were obtained only in the latter part of the nineteenth century. The position of both states at the junction of the Rhineland and the sea has long given them commercial advantages of the greatest value. Holland and Belgium, in this order, are to-day the most densely populated countries in Europe. The integration of the economies of Belgium, the Netherlands, and Luxembourg in the "Benelux" Union is to some extent a resumption of former historical trends.

A word as to nomenclature. The low-lying regions which the English now know as part of Holland and Belgium were formerly appropriately known as the "Low Countries." Nowadays only the northern section retains its title of the "Netherlands" (Nederland), which perhaps is just as well, since the Belgian state, created in 1839, mainly out of fragments of ancient Flanders, Hainault, Brabant, and Luxembourg, includes a southern mountainous strip. The term Holland (=hollow land), however, properly applies only to one part of the Nederland, *i.e.* the part between the Maas (Meuse) estuary on the south and the Helder on the north, where the land is mainly below sea-level, with the North Sea on the west and the Zuider Zee (= "South Sea") on the east.

The countries are transitional between central and western Europe. Culturally and climatically they belong to the west, structurally they belong mainly to central Europe.

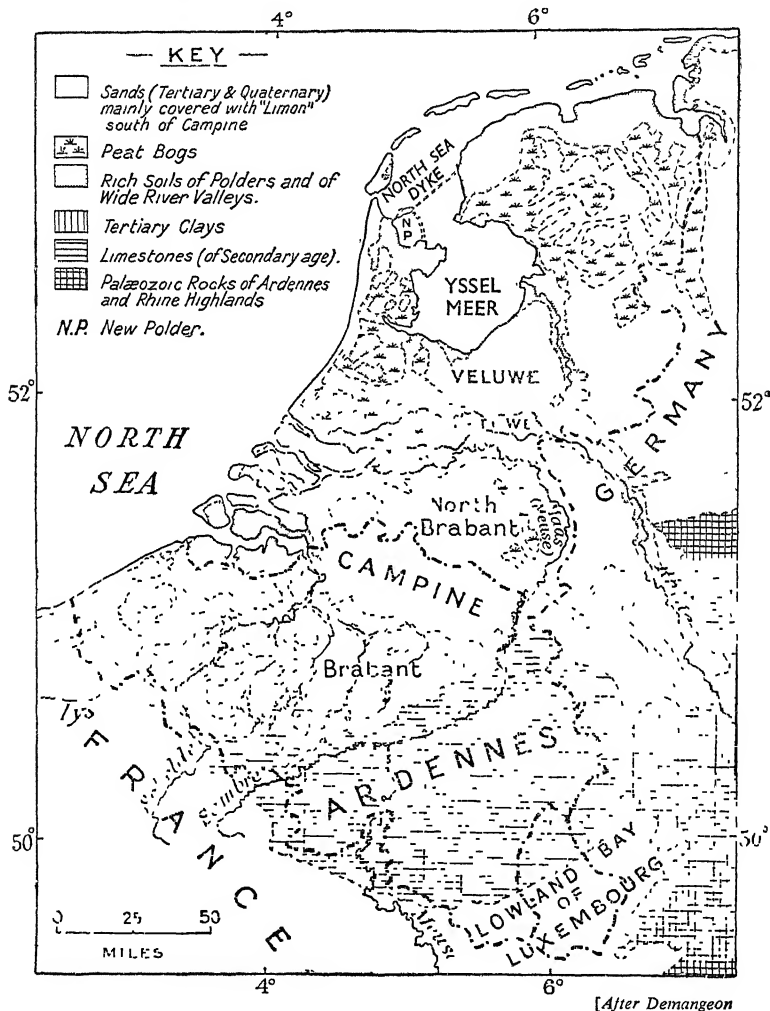


FIG. 51.—GEOLOGICAL MAP OF THE NETHERLANDS AND BELGIUM.

BELGIUM

With the exception of the Campine or Kempenland in the north-east, the natural regions of Belgium are symmetrically arranged in

parallel strips, running from west-south-west to east-north-east, parallel with the North Sea coast.

The Ardennes. Most of the southern portion of Belgium is occupied by the horst, or dissected plateau, of the Ardennes, a western continuation of the Rhine Highlands, which stretch from east-north-east to west-south-west following the direction of the strike. The highest part of the Ardennes lies near the south-eastern frontier of Belgium, and reaches nearly 2,000 feet. This, combined with the westerly position, gives the Ardennes a very heavy rainfall, and as the slates and greywacke, of which they are mainly composed, do not produce a fertile soil, the region is one of forests, moors, and cattle-pastures. It is thinly populated, though there are a number of small tourist resorts.

Separating the High Ardennes from the Low or Sub-Ardennes to the north is the Famenne depression, developed in soft Devonian shales, and occupied in its eastern section by the River Ourthe.

In the region of the Low or Sub-Ardennes the old peneplain has been less elevated than in the High Ardennes, and heights do not often exceed 1,000 feet. The climate is less severe, and the region possesses bands of limestone, usually covered with loam ("limon"), which provide wide stretches of arable country amidst the forests. The Meuse cuts a rather deep valley from south to north through both these zones to join the Sambre at Namur, whence it assumes the same direction as the latter river and flows parallel with the strike.

The Sambre-Meuse Depression and the Belgian Coalfield. On the northern side of the old massif, and still partaking of its folded character, are the coal-measures containing the main productive coalfields of Belgium. The output averages about 23 million tons per annum out of a total of 28 million tons for the whole country. The coal-measures are a continuation of those across the frontier in France, and they stretch eastwards from the coalfield of Mons to reach the Sambre valley near Charleroi, where they first outcrop on the surface. Thence the coal-measures continue eastward, though only as a very narrow unproductive band along the east-west stretch of the Meuse valley, until they broaden out and once more become productive in the Liège district. From Mons to Liège, for a distance of some eighty miles, there is a great concentration of industrial development, the great iron, glass, zinc, and chemical industries of Belgium being situated on these coalfields; and even between the Charleroi and Liège fields, where hardly any coal is worked, it is brought on the canalised river to supply a considerable number of factories. The Belgian coalfield, like its continuation in France, suffers from contorted seams which make the coal difficult to work and therefore expensive; the average

output per man being only half the corresponding output in England and a sixth of that in the U.S.A., though the hours of work in Belgium are longer. Industry here, however, got an early start and has a good deal of historic momentum behind it, the first Belgian blast-furnace to use coke being started as early as 1823, on the Liège coalfield at Seraing, by an Englishman, John Cockerill, whose firm grew until it is now one of the largest in Belgium. At first local iron-ore was used from the Carboniferous and Devonian limestones of the Lower Ardennes, but practically the whole of the iron-ore now has to be imported. In the same way the zinc, formerly obtained near Moresnet, is now almost exhausted, but the industry remains.

The industrial region is composed of a large number of towns and villages of small and medium size, though Liège with its suburbs numbers about 250,000 and Charleroi with its satellites is about the same size.

An isolated but important industrial region is situated to the east of Liège round Verviers in the valley of the Vesdre. This region already manufactured textiles before the days of power looms, the principal geographic factor being the pure streams for washing the wool and for supplying power for fulling. The first mechanical spinning frame and power-loom for wool set up on the Continent were erected here about 1798, again by an Englishman, William Cockerill, father of the more famous John.

The Sambre-Meuse depression offers a route skirting the Ardennes and is used by the Paris-Cologne express. The valley itself, particularly below Namur, is about a mile wide and highly cultivated. Namur (31,000¹, with suburbs 45,000), an old route centre at the confluence of the Sambre and Meuse, has a certain amount of industrial development.

The Belgian Plain. North of the industrial region of the Sambre-Meuse depression begins the Belgian plain of unfolded Secondary, Tertiary, and later deposits. It is drained principally by the River Schelde, which flows across Belgium in a north-easterly direction from its source in France towards its mouth in the Netherlands. The plain can be divided into three parts, first the *limon*-covered plain of middle Belgium centred on Brussels and comprising the old provinces of Brabant, Hainault, and Hesbaye, secondly the clayey and sandy plains of Flanders bordering the sea, and thirdly the sandy Campine which stretches to the north-east bordering the Dutch frontier.

The Plain of Middle Belgium. This slopes down gently northwards from a height of some 500 feet near the Sambre-Meuse depression

¹ Population figures are estimates for 1946.

towards the wide low-lying valley of the Schelde. It is traversed by a number of the Schelde's right-bank tributaries which flow in rather deep valleys cutting down to the Hercynian core in the south, though they become shallower farther north. It consists largely of Tertiary sands in Brabant, has considerable stretches of chalk in the south-east in Hesbaye and of clays in the south-west in Hainaut, but almost everywhere the solid deposits are masked by a thick covering of "limon," which gives the region a great uniformity. As in France, the *limon* is the special domain of sugar-beet and cereals, especially wheat, but the agriculture is very varied and includes



[Courtesy Belgian Embassy]

FIG. 52.—INTENSIVE CULTIVATION IN THE PLAIN OF HESBAYE.

This *limon*-covered plain, south-east of Brussels, is cultivated on the strip-system. Note the hedgeless fields. Population is nucleated into large villages.

orchards and market gardens, and so intensive that the country is divided into minute, hedgeless fields, with a great deal of hand-labour bestowed upon them. There are practically no trees. In spite of the high density of population there is only one really large town, Brussels (916,000 in 1946), the capital of the whole country and once the seat of the princes of Brabant, whose choice was the deciding factor in the city's growth at the expense of neighbouring centres, such as the similarly situated Louvain. The city is the chief commercial and intellectual centre of the country and also carries on a very varied industry, the necessary coal being brought

by way of the Charleroi-Brussels canal, along whose banks many factories form an industrial link between the two conurbations.

Flanders. Flanders is an historical entity rather than a geographical one, since it comprises two distinct regions of different soils and relief, first, the flat maritime plain formed of clays deposited by a post-glacial invasion of the sea, and secondly the undulating, mainly sandy, plain which stretches south-east to include the valley of the Schelde. South of Ghent, however, the Schelde valley is crossed and the country partakes of the character of Brabant with stretches of *limon*. It is man, however, who has imposed a unity on this little area, principally by so improving the sandy soils of the interior that they are as productive as the naturally fertile clays of the maritime plain. The Flemings were able to do this owing to their discovery of the value of heavy manuring. This rose out of their desire to abolish the wasteful system of fallowing, in order to feed the large numbers of people in the mediæval industrial cities, who, in the days of difficult transport, had to be supplied with food from the immediate neighbourhood. This leads back to the early development of city life in Flanders, which is one of the unique features of the country. Bruges, Ypres, and Ghent, for instance, are known throughout the world for their mediæval monuments to civic pride, the "beffroi" of Bruges and that victim of the war of 1914-18, the shell-destroyed cloth-hall at Ypres, being particularly famous. There is no wholly satisfactory explanation for this burgeoning of city life, though geographically the country had the advantage of being situated at the meeting-place of three important river routes, along the Schelde, Meuse, and Rhine, and where these routes met the sea, whereas the Dutch were too pre-occupied in early days in fighting the sea to be able to take advantage of the commercial opportunities offered by a somewhat similar position. The great, but in mediæval times backward, land of England also provided a fine market just across the narrow seas for Flemish textiles and other goods, England afterwards supplying the raw material (wool), much in the same way that Africa now provides raw materials in exchange for England's manufactured goods. Of the historical aspect, including the enlightened legislation of certain of its rulers, this is not the appropriate place to speak, but when all the favourable factors have been displayed the fact remains that it was the quickness of the Flemings in seizing their opportunity that really counted, an opportunity which unfortunately for them soon passed. The great development of city life began in the twelfth century and decay set in at the beginning of the fifteenth century, partly owing to the silting up of the harbours and partly owing to political troubles.

The contribution to agriculture remained, however, and though the Flemings were not the only people in the world who discovered how to abolish the wasteful method of fallowing, yet it was from Flanders that the method spread to England and to other parts of Europe. The abolition of the fallow was combined with the growing of root-crops as a winter feed for cattle, and the latter provided the manure necessary to restore the fertility to the soil, though sewage from the dense urban population and estuarine silt were also used. At the present day, manures of all kinds are employed, holdings are generally very tiny, many not exceeding half an acre, and cultivation is so intensive that the spade is commonly used instead of the plough. The people now are usually poor and rather backward, clinging to old ways.

The variety of crops grown is great, *e.g.* cattle-feeds including root-crops, clover, and other forage crops, industrial cultivations such as sugar-beet, chicory, and flax, cereals for cattle fodder and human consumption, though the area under cereals was decreasing down to 1939. Dairy cattle and pigs are common in both areas. The two regions, however, have a totally different appearance, the flat maritime plain being quite treeless owing to the force of the sea winds, while the undulating interior plain is a country of trees, each field being surrounded by a row of trees useful for timber. It was on the basis of the home-grown flax that the Belgian linen industry grew up along the Lys tributary of the Schelde, the waters of the former river being renowned for their excellence for the retting process, which consists of steeping the flax stalks until the fibres separate. This textile succeeded wool in the sixteenth century when England had established a woollen textile industry of her own. At the present day it has been partly superseded by cotton, the earliest spinning-jenny on the Continent for cotton being set up here in 1798. The linen industry, however, is greater than can be supplied in the country itself, and flax is also imported. The textile region of Flanders is centred in Ghent (162,000, with suburbs 230,000) at the junction of the Schelde and the Lys, and is spread through the Lys and Schelde lowlands in many smaller towns including Courtrai or Kortrijk (40,000), Lockeren (26,000), Alost or Aalst (42,000), St. Nicholas-Waes (44,000), and Roeslare (32,000).

The coast of Flanders offers no site for a large port; its ancient "cordon littoral," which once contained useful gaps, now being a practically continuous line of sand-dunes bordering the maritime plain. Ostend (49,000), is a packet station, the chief fishing port of Belgium, and a seaside resort; the old town of Bruges or Brugge (53,000) is now connected by a ship canal, 26 feet deep, to Zeebrugge.

A whole row of bathing resorts is found along the dune coast, which in all is only forty miles long.

The Campine. This plain is an expanse of coarse sands and gravels brought down by the Meuse during the Quaternary Ice Age. It extends across the frontier into Holland and is a barren windswept area of heath and marsh in process of reclamation. Sand-dunes often occur, in places fixed by the planting of pine trees. In certain areas the region resembles the Landes of Aquitaine with the same impermeable "alios" of ferruginous tufa at depth. The area is being reclaimed by the planting of pine trees (*Pinus sylvestris*), by the bringing of water in canals from the Meuse to irrigate the dry soil, by heavy manuring, and the cultivation of nitrogenous crops. Root and forage crops, rye and oats are now considerably grown, and the dairying industry is well established, but the most highly cultivated region is round Antwerp which obtains here its supplies of market-garden produce.

The discovery of the Campine coalfield, first worked in 1917, is having the effect of introducing manufactures, *e.g.* zinc, glass, pottery, rolling-mills, and chemicals. Although the coalfield is at great depth, some 1,500 to 3,000 feet, the seams are more productive than those of the Charleroi-Liège fields, and the reserves are estimated at nearly three times the amount of the old Belgian coalfield, *i.e.* about 8,000 million tons as against 3,000 million tons. In recent years the output has been about 7.5 million tons annually.

Antwerp. This city of 260,000 people, or 480,000 with the suburbs, is the great port not only of Belgium but to some extent of the Rhineland and north-eastern France also. It is situated fifty-three miles up the Schelde but is accessible even at low tide to large ocean-going vessels drawing 26 feet of water. It is one of the three leading ports of the continent of Europe, vying in tonnage with Rotterdam and Hamburg, and handling some 20 to 22 million net tonnage annually. Serving, as it does, one of the most populous regions of the earth, it imports, as one would expect, foodstuffs and raw materials, and exports manufactured goods. It has become the centre of varied industries, such as the chemical, metal, engineering (including motor cars and ship-repairing and building), sugar refining, and tobacco. The diamond industry now exceeds that of Amsterdam. The new Albert Canal from Antwerp to Liège should add to its importance.

Economic Summary. Belgium is, after the Netherlands, the most densely populated country of Europe with an average density of 735 per square mile, in spite of the fact that the thinly populated regions of the Ardennes and the Campine reduce the average. In Brabant the density reaches 1,386 per square mile.

The country depends to a very great extent on the export of manufactured goods and the import of raw materials. For instance, 90 per cent. of the total production of glass was exported, 60 per cent. of the textiles, and a high percentage of the chemical and engineering output. In spite of its small size and a total population of only 8.6 millions (in 1950), Belgium is able to compete on the world market owing to a comparative abundance of coal, an established tradition

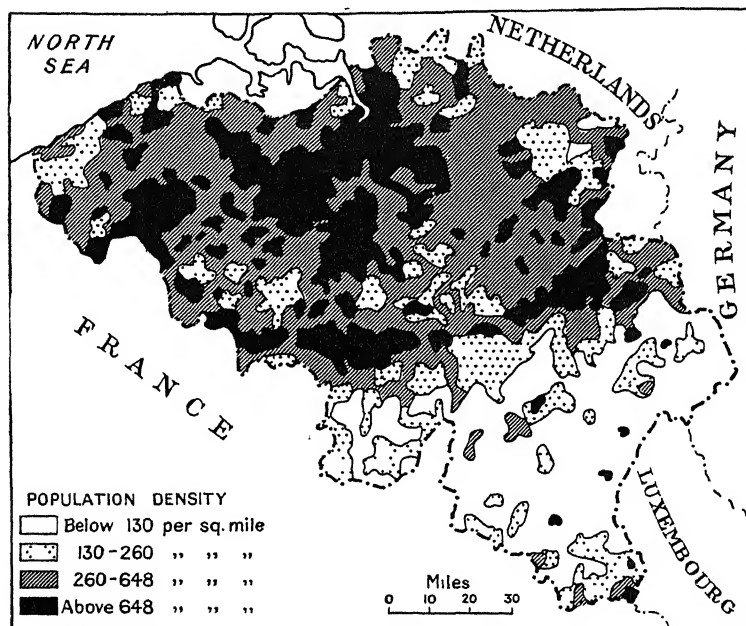


FIG. 53.—BELGIUM: DISTRIBUTION OF POPULATION.

Belgium is the most thickly populated country of Europe, with especially high densities (a) on the northern plains around Brussels, Ghent, and Antwerp, and (b) on the coalfield from the French frontier eastward along the Sambre-Meuse depression. Population, however, remains scanty on the infertile Ardennes.

of industrial skill, an unsurpassed system of internal communications by water, rail, and road, and the possession of small holdings by large numbers of industrial workers which serve to supplement their income and to tide them over spells of unemployment. Nevertheless, Belgian industry has been adversely affected by the rise of economic nationalism and the raising of tariff walls against her manufacturers. The Belgian Congo, with its supplies of radium, copper, and diamonds, is proving an immensely valuable asset.

The exports naturally consist of manufactured goods, particularly of metal goods and engineering products, textiles, glass, and chemicals. The imports are headed by foodstuffs, followed by raw materials for the textile and metallurgical industries.

The business language and that of the educated classes is French, to which Walloon, the language of the southern part of Belgium, has been assimilated. North of a line joining, roughly, Courtrai and Brussels, Flemish is widely spoken, and of recent years after a good deal of agitation it has been placed on a parity with French in Flanders. The proposed economic union of the "Benelux" countries (Belgium, Netherlands, Luxembourg) came into being in 1950.

Luxembourg. The little state, known as the Grand-Duchy of Luxembourg, has since 1946 been a member of the Benelux customs union. It lies partly on the Ardennes Massif, but mainly on the scarplands which continue from France to form the lowland bay of Luxembourg, part of which lies in the extreme south of Belgium proper. The Triassic and Lias series are here represented, the minette iron-ore of the latter being present in considerable quantities. The quantity of iron-ore mined in 1937 was 7,754,000 metric tons, but in 1950 was 3,845,000 tons.

THE NETHERLANDS

The low-lying country of the Netherlands represents the western continuation of the Germano-Polish glaciated plain, although its southern province of South Limburg escaped glaciation. It shows an alternation of reclaimed marsh with high fen and poor sandy heaths, the marshlands lying along the sea-coast and river valleys and the high fens and heathlands generally farther inland. Three large rivers have their mouths in the Netherlands, the Schelde, the Maas, and, most important of all, the Rhine, which also sends a distributary towards the Zuider Zee (now the Yssel Meer), and it is the presence of these great natural highways inland which gave and still gives the country its importance.

The same sequence of glacial and post-glacial oscillations of level took place here as in the German lowlands west of the Elbe and produced the same type of landscape and the same problems for man. (*See Chapter XIX.*) The glacial sands and gravels extend as far as the Rhine and even beyond, and, south of this river, sand was widely spread by the swollen rivers of the Ice Age. Later the rivers cut broad shallow valleys, leaving the sandy tracts standing between them as low terraces, which only exceed 300 feet high in Veluwe north of Arnhem and generally range from sea-level to about 100 feet high.

At the end of Glacial times a considerable rise in the level of the sea led to the formation of the Straits of Dover, and this allowed marine currents from the south-west to sweep a sandbank or sandbar, afterwards crowned with dunes, in front of the coast. Marine clays were deposited at first behind this "cordon littoral," but a slight relative gain of the land, and the rise in height of the protective rampart of sand-dunes allowed fresh-water lagoons to take the place of salt-water marshes, and in these the formation of peat began a natural process of land reclamation. During the first century A.D. the land probably stood slightly higher than it

does at present, and the protective line of sand-dunes was less broken, though it was apparently never continuous at the mouths of the Rhine and Maas in Zealand (= "sea-land"). The Roman historian Pliny records that the native inhabitants took refuge during times of flood on large artificial mounds, the *terpen* or *werden* which are still to be seen especially in Zealand and Friesland.

Unfortunately the level of the sea in respect to the land continued to oscillate, and on more than one occasion, *e.g.* in late Roman times, the sea breached the sand-dunes and again flooded widely, while much land was lost in the late Middle Ages by the transformation



FIG. 54.—THE DYKED LANDS OF THE NETHERLANDS.

About half of the land is protected by dykes.

of the fresh-water Lake Flevo into the much larger salt-water Zuider Zee. Protective dyking had certainly begun before the year A.D. 1000, possibly as early as the seventh or eighth century, and were it not for man's success as a geological agent, all the western part of the Netherlands would now be under the sea.

Man also had to protect himself against the rivers, whose high-water level is above that of the surrounding land. Although the lower courses of the Rhine and Maas are so valuable for navigation, yet they have in reality semi-deltaic mouths, a unique phenomenon in the tidal North Sea. The explanation lies in the fact that the high tide advancing southward along the North Sea almost coincides with

the low tide advancing up the English Channel, with the result that the piece of coast from the mouth of the Elbe to the mouth of the Schelde has only a very small tidal range, about 5 feet at the Helder, increasing to 12 feet at the mouth of the Schelde. The main distributaries of the Rhine used to flow to the north *via* the Yssel River into the Zuider Zee (Yssel Meer) and to the west *via* the Oude Rijn (= "Old Rhine") past Utrecht and Leiden. The latter river was the frontier of the Roman Empire, and though of negligible importance to-day, it is the only distributary which still bears the name of Rhine. The present main distributary is the Waal, which near the sea becomes inextricably mingled with the distributaries of the Maas, and indeed takes the name of the latter river in the Brielle Maas or New Maas, the Oude Maas or Old Maas, etc.

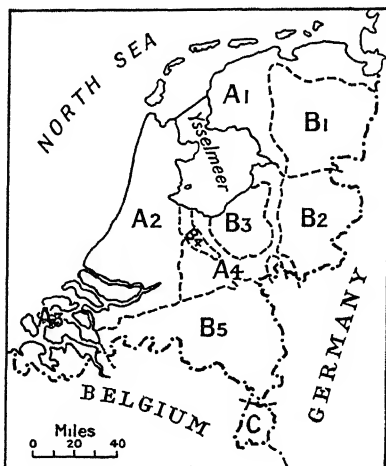


FIG. 55.—GEOGRAPHICAL REGIONS OF THE NETHERLANDS.

A = Polder Lands:

- (1) of parts of Friesland and Groningen.
- (2) of North and South Holland
- (3) of Zeeland.
- (4) along alluvial valleys.

B = The Sandy Lands:

- (1) of Drenthe and interior Friesland and Groningen.
- (2) of eastern Gelderland and Overijssel.
- (3) of Veluwe.
- (4) of the Utrecht-Gelderland ridge.
- (5) of North Brabant and North Limburg.

C = The *limon*-covered plateau of South Limburg.

Geographical Regions. The Netherlands fall naturally into two main types of country (*see* Fig. 55): (a) the low-lying fertile lands along the coast and along the main rivers, which require dyking; (b) the higher regions of the east and south, which are mainly sandy and infertile, except for the "appendix" of South Limburg which is covered with fertile *limon*. The dyked lands, which are below high-tide level or below the level of "normal" river floods are the main historic lands of the Netherlands, whereas the higher, sandy tracts carried few people and were relatively unimportant until modern times.

The Historic Dyked Lands. There are four main areas of *polders*, that is of drained and dyked lowlands, in the Netherlands. First, the marine clays and peaty fens of Friesland and Groningen in the

north, bordering the Wadden Sea, and partially protected by the "breakwater" of the dune-crowned Frisian Islands. Secondly, the peaty fens of north and south Holland which lie east of the dune rampart stretching from the Helder to the Hook. Thirdly, the marine clays of the Zealand Islands and adjacent islands of south Holland. Fourthly, the dyked riverine lands along the Rhine-Waal-Maas. The reclaimed land has not only to be protected



[Photo: Allan Murray]

FIG. 56.—THE YSSELMEER DYKE.

This dyke, $18\frac{1}{2}$ miles long, shuts off the Zuider Zee from contact with salt-water, and the resultant Ysselmeer is a fresh-water lake, in process of partial reclamation. A motor-road and footway traverse the dyke; note the brick paving.

by dykes against tide and flood; but in many cases the water accumulated in the hollows has to be pumped up from the canals intersecting the polders to a sufficiently high level for it to be drained off to the sea or rivers, hence the large number of windmills in Holland, now largely replaced by power pumps. The more recently created polders, such as those on the sites of the interior lakes in Holland, the Haarlemmermeer and others, which were drained in the nineteenth century, are considerably below the level of low

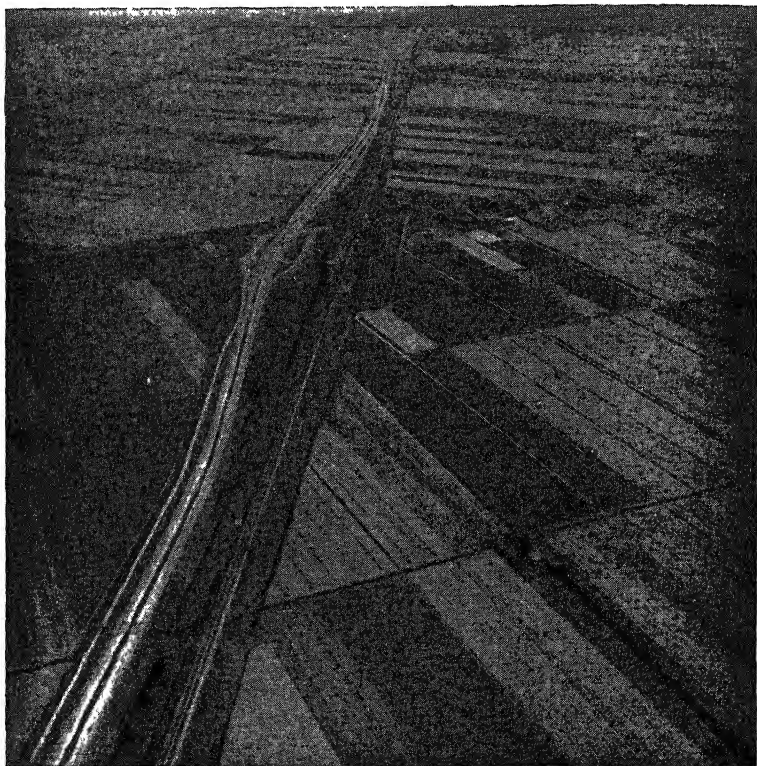
tide, and so also are the polders of the Zuider Zee, where it is hoped in time to reclaim an area of 527,500 acres.

By means of a great sea wall eighteen miles long, the Zuider Zee has been converted into a fresh-water lake, now known as the Yssel Meer. The first of the polders (50,000 acres), in the north-west, on the site of the Wieringermeer, was completed about 1930 and brought under full cultivation in the next few years; work was completed in 1940 on the north-east polder (120,000 acres). The rich soil of the polders lends itself not only to fine pasture, but also to arable land, though dairy cattle are becoming increasingly the dominating interest. However, cereals, sugar-beet, tobacco, flax, vegetables, and other crops are grown, especially in Groningen and Zeeland. The bulbs of the Haarlem district of Holland are world famous. Along the inner side of the sand-dunes, where peat, silt, etc., could be added to the light soil of the older dunes, there is a belt of country devoted to intensive horticulture, including glass-house culture, where a rural density of population of over 2,000 per square mile is attained in places. As in Denmark, there exist in the Netherlands exceedingly good methods of marketing the dairy and vegetable products abroad.

The Towns of the Dyked Lands. It is impossible to understand the urban life of the historic dyked lands without taking into account the fact that the towns are not dependent merely on the little Netherlands of some 13,000 square miles, but that their inhabitants derive their wealth also from centuries of sea trading, from an empire of 50 million people, and from the land transit trade to Germany. Hence the large size of the ports of Amsterdam and Rotterdam, the number of towns of medium size, and the number and importance of the university towns. Urban development is concentrated mainly in Holland itself, where a double sea frontage and the Rhine distributaries provided unique opportunities for the establishment of trading ports, even though the actual sites left much to be desired. Amsterdam (798,000)¹, on an inlet of the shallow but sheltered Zuider Zee, was already a great port at the end of the fourteenth century, but with the growth in the size of vessels a route had to be sought direct to the open sea. The North Holland Canal was used from 1815 to 1876, and the North Sea Canal from 1876 onwards. The latter, with a depth of 46 feet, reaches the sea at Ymuiden. The annual tonnage of shipping was 4.7 millions in 1938, the goods consisting mainly of colonial produce, especially from the Dutch East Indies for which Amsterdam is the great entrepôt. The suburbs, including Zaandam, have a large and very varied manufacturing industry, with flour milling, brewing,

¹ Population figures are, except where stated, estimates for 1947.

sugar-refining, cocoa and margarine manufacture, and many others. In addition Amsterdam is the great commercial and intellectual centre of the Netherlands and the "official" capital. A number of towns lie on the eastward side of the line of sand-dunes, including Haarlem (156,000) and The Hague (Dutch, 's Gravenhage; 524,000),



[Photo: Allan Murray]

FIG. 57.—TYPICAL VIEW IN THE DUTCH POLDERLANDS, SOUTH OF AMSTERDAM.

The geometrical pattern of these dyked lands is very striking. The railway and new national highway are superimposed upon an older road pattern, along which farms are aligned.

the royal residence and the seat of government, reputed the wealthiest town of the country owing mainly to the large numbers of business men who have settled there on retirement.

Most of the other towns are placed on the distributaries of the Rhine, and sometimes have decayed as the water channels have silted up, thus Utrecht (183,000) and Leiden (86,000), both university

towns on the Old Rhine, were formerly of greater relative importance, but the northern distributaries of the Rhine have been abandoned progressively in favour of an ever-more southerly channel, owing to the increasing amplitude of the tides from north to south and the consequent increase in scouring action southwards.



[Photo: Allan Murray]

FIG. 58.—WATERLOGGED AREA IN THE DYKED LANDS OF HOLLAND.

Injudicious peat removal was largely responsible for these water-logged areas, which now provide popular "Broads" for sailing.

Although canals usually follow the old courses, the number of distributaries is now reduced to three:—the Yssel, which flows past Deventer to the Yssel Meer, officially being allowed 11 per cent. of the total water; the Neder Rijn or Lek, which flows past Arnhem (pop. 96,000) and Rotterdam, 22 per cent.; and the present main distributary, the Waal, flowing past Nymegen (pop. 106,000), 66 per

cent. Arnhem and Nymegen owe their positions to the narrowing of the flooded alluvial belt between two spurs of higher and drier glacial ridges, which here come close down to the rivers and offer firm, defensive sites.

The great port of Rotterdam (637,000) handles over half of the Netherlands' shipping, but acquired its leading position only in the nineteenth century. It takes its name from the little river Rotte which here joins the New Maas. Owing to progressive silting, only the cutting of a great artificial "Nieuwe Waterweg," begun in 1863, saved the port. Normally, Rotterdam is one of the three greatest ports of the mainland of Europe, only Antwerp and Hamburg having a greater tonnage in some years. The Hook of Holland (Dutch, Hoek van Holland), at the western end of the "New Waterway," is a packet station towards England, and so is Flushing (Dutch, Vlissingen) on the island of Walcheren in Zeeland.

Apart from Holland and the Rhine-Meuse delta, towns are not well developed, Groningen (131,000) being the only large town of the north-east, and Leeuwarden, the capital and largest town of Friesland, having only 76,000 people. Zealand has many small late-mediæval towns, but the silting of the channels has hampered their growth.

The Sandy Areas. The regions to the north of the Maas, lying in the provinces of Friesland, Groningen, Drente, Overijssel, Gelderland, and eastern Utrecht, consist of a complex of outwash sands, clayey ground-moraine, and morainic ridges, while the regions to the south of the Maas, in North Brabant and North Limburg, consist almost solely of outwash sands. The ice sheet at its maximum reached a line running approximately from Nymegen *via* Utrecht to Haarlem; but the ground-moraine, deposited beneath it, was later almost covered by outwash sands. South of the Yssel Meer are ridges of terminal moraines, consisting of sand and gravel, which actually form hills of some altitude, especially in the Veluwe (= "bad land") which reaches 327 feet, and in the Utrecht-Gelderland ridge (*see* Fig. 55). These two heights almost surround the Geldersche Vallei, or valley of the River Ems, which marks the site of a former glacial "tongue basin."

The sandy and gravelly soils are very poor in plant food. In many places the loose, white sand looks as unproductive as the sand of the seashore, and at best was a natural heathland and at worst, in Veluwe, was often piled into unstable sand-dunes, now planted with pine trees. In places, however, owing to the haphazard deposition of the glacial material and the consequent lack of drainage system, sphagnum peat bogs were formed, especially

north-east of the Zuider Zee in east Friesland, Drente, and Groningen. Exploitation of the bogs for peat has long been carried on,

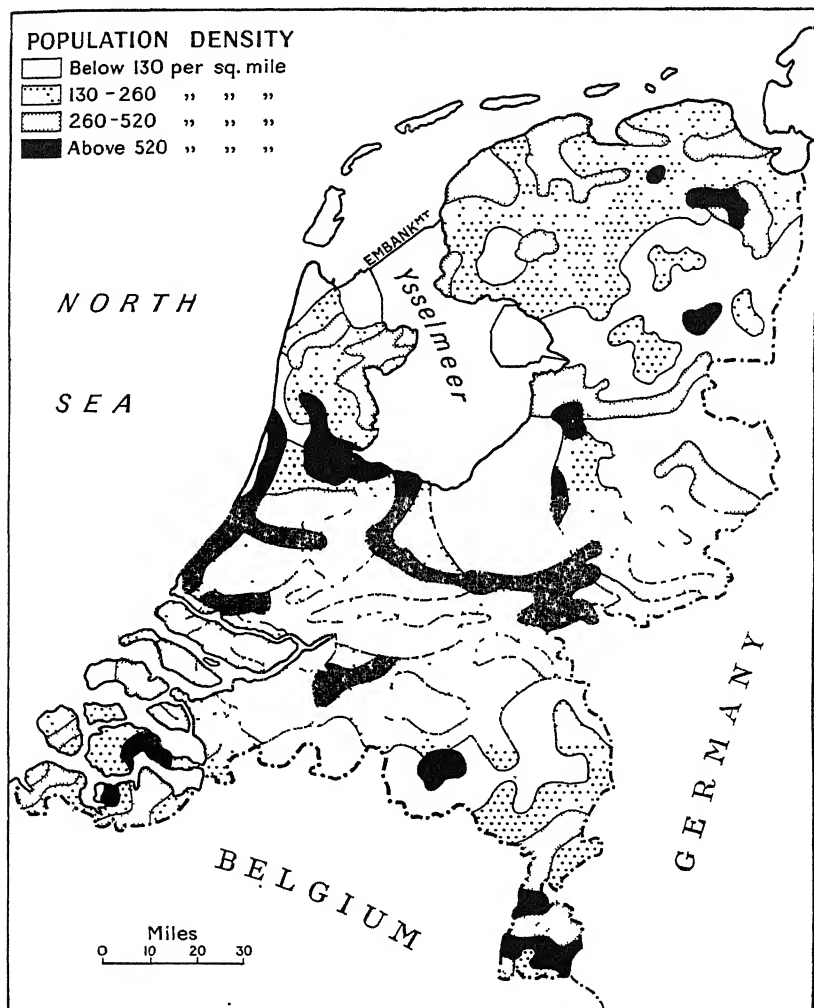


FIG. 59.—THE NETHERLANDS: DISTRIBUTION OF POPULATION.

Very high densities in the polders, the alluvial valleys, and the reclaimed high-fens contrast with very low densities on the sandy areas of Veluwe, parts of North Brabant, and of the north-eastern provinces.

but their reclamation began only in the seventeenth century, when the city of Groningen undertook an ambitious project of reclaiming

a large area of "High Fen" which lies to the south-east. Drainage canals were cut; the peat was dug out, the top layer being preserved and mixed with the underlying sand; finally the soil was heavily manured. This method, pioneered by Groningen, was later adopted elsewhere in the Netherlands, and in many other parts of Europe. The resultant soil gives excellent crops of potatoes, oats, and rye, and many kinds of vegetables. This type of reclamation, involving the creation of a complex drainage system, was a large-scale enterprise needing considerable capital and organisation, and was sponsored by the large towns, special societies, etc. On the other hand, the heathlands have been partly reclaimed in the course of centuries by peasant farmers, who kept a few sheep, a few beehives, and cultivated a little patch of rye or buckwheat. Nowadays modern methods of agriculture, including the growing of root-crops which do well in this light soil, enable cattle to be kept, though these are mainly stall-fed, and the manure is used to improve the land. Cattle and pigs, the latter partly fed on skim-milk, and poultry, now dominate farming on the heathlands.

There is a very considerable industrial development in the sandy areas, partly old-established and partly modern. Domestic industry was started in order to supplement the meagre returns from agriculture, especially in the Twente region of eastern Overijssel and in North Brabant. The Twente region is mainly devoted to cotton textiles, the main centre being Enschede (100,000), but there are varied engineering and chemical industries; Overijssel actually possesses a higher percentage (49 per cent.) of its population engaged in industry than any other province, though it is followed closely by North Brabant and Limburg, each with 44 per cent. North Brabant originally concentrated on the woollen textile industry, which is still carried on at Tilburg (113,000), though the rayon industry is of growing importance, but all kinds of secondary industries have recently been added, especially the manufacture of electric lamps, radio apparatus, etc., at Eindhoven (133,000). Just west of 's Hertogenbosch (53,000), the capital of North Brabant, stretches the Langstraat, an almost continuous line of villages, containing about 75,000 people, which concentrates the boot and shoe industry of the Netherlands.

The Plateau of South Limburg. This small area is very unlike the rest of the Netherlands. It consists of a dissected plateau of dissected rocks, covered with deposits of fertile *limon*; it is generally over 300 feet in height and in the extreme south-east reaches over 1,000 feet. Its soils are highly cultivated, particularly for wheat and sugar-beet, but the region has acquired especial importance during the present century as it contains the only workable coalfield.

The chief mining centres are Heerlen (56,000) and Kerkrade (40,000), the output averaging $13\frac{1}{2}$ million tons, 1936-39.

The old town of Maastricht (74,000) stands anomalously on an enclave on the west side of the Maas, and was already important in Roman times as the crossing point (*trajectum*) of the river.

Economic Summary. A number of historical circumstances combined in the fifteenth and sixteenth centuries to render the Dutch conscious of the advantages of their geographical position, and having thrown off the Spanish yoke in the sixteenth century, they turned



[Photo: Allan Murray]

FIG. 60.—VIEW IN ONE OF THE BARGE BASINS OF THE PORT OF ROTTERDAM.

Rotterdam, one of the chief ports of Europe, is an important transshipment point for bulky goods using the Rhine river system.

their attention to overseas trading, and in the seventeenth century were the leading maritime people in the world, though later eclipsed by England. As a heritage of these times the Dutch still possess important colonies in the East Indies (which provide overseas opportunities for many sons of Holland), and also the less important Dutch Guiana in South America; but the large size of the country's trade was due mainly to the development of the Ruhr coalfield in Germany in the nineteenth century and to the transit trade with the Rhinelands generally. The value per head of Dutch commerce was

the highest in the world. The merchant fleet also revived during and after the war of 1914-18 and took eighth place among the world's mercantile marine before 1940. It may here be noted that the Netherlands have never possessed the raw material for building ships, neither timber in the old days nor iron-ore at the present day, but they were in a good position for importing timber from Germany *via* the Rhine and iron-ore from Sweden, and a large



[Photo: Allan Murray]

FIG. 61.—THE CHEESE MARKET, ALKMAAR, NORTH HOLLAND.

Dairy produce is characteristic of the Dutch polders. Note the traditional costumes.

amount of shipbuilding is normally carried on between Rotterdam and Dordrecht, inclusive. During the present century there has been a great development of "secondary" industries, especially of the lighter types of engineering, and of the working up of colonial produce from the Dutch colonies, *e.g.* margarine, cocoa. The well-known and old-established diamond-cutting industry of Amsterdam is a comment on the wealth of the Netherlands as a result of its overseas trading ventures.

There is little development of heavy industry, partly owing to the paucity of coal and raw materials.

Apart from the transit trade the exports are mainly agricultural, and consist chiefly of dairy produce, vegetables, and flowers, but the specialised agriculture means that large quantities of cereals, especially wheat and maize, must be imported. Among other imports, timber, coal, textiles, iron, and steel goods take a high place.

REFERENCES

A. Demangeon's *Belgique, Pays-Bas, Luxembourg* (Paris, 1927) gives a detailed regional account, while *La Néerlande, Etudes générales sur la géographie des Pays-Bas*, by various authors (Leiden, 1938), is also recommended. R. Blanchard's *La Flandre* (Paris, 1906) is a study of the Flemish plain in France, Belgium, and Holland. The first volume of H. Pirenne's *Histoire de Belgique* (Brussels, 1902) gives a good account of mediæval industry, commerce, and agriculture in Flanders.

SECTION III—NORTHERN EUROPE

CHAPTER XII

GENERAL INTRODUCTION TO NORTHERN EUROPE

THE countries of Norway, Sweden, and Finland may be conveniently grouped together under the title of Fennoscandia. Although the region is probably more favourable to human habitation than any other area in the same latitudes ($55^{\circ} 22'$ to $71^{\circ} 15' N.$), yet the traveller cannot but be impressed by the vast stretches of forest and *fjeld* (moorland) and the constant assertiveness of bare rock. A scanty human settlement is the natural consequence of the northern climate, high relief, and much infertile soil, so that although the area of Norway is equal to that of the British Isles, its population is less than three millions, as against forty-nine millions for our own islands, while Finland, although considerably larger, has only three and a half million people, and even Sweden, with an area 50 per cent. greater than that of the British Isles, has a population of only six millions.

These figures indicate not only a small amount of farmland, but also an absence of any great industrial development, such as may lead to the growth of densely-peopled manufacturing districts. While it is true that Norway, Sweden, and Finland emerged from barbarism at a very late date compared with southern and western Europe, yet their outlook is to the west and south, and they have been in fairly close touch with the civilised life of the more southerly lands since their conversion to Christianity in the tenth, eleventh, and twelfth centuries. In many respects Norway, Sweden, and Finland appear to lead Europe, especially in education and general culture and such material matters as the widespread application of modern electrical devices.

It may be said, however, that to English eyes large areas of Fennoscandia bear a "colonial," "backwoods," or pioneer aspect, reminiscent, say, of Canada, and to a large extent this aspect is due to the same causes. Up to the Industrial Revolution, only the southern and coastal regions of Fennoscandia were developed to any extent, and even there the population which the soil could

carry was small. With the coming of a world demand for timber in the nineteenth century, however, Sweden and Finland discovered a use for their vast forested hinterlands, roughly north of 61° N., which they had been trying, with scant success, to colonise for the previous three centuries. There is, in particular, a strong likeness between Fennoscandia and the eastern part of Canada, a likeness

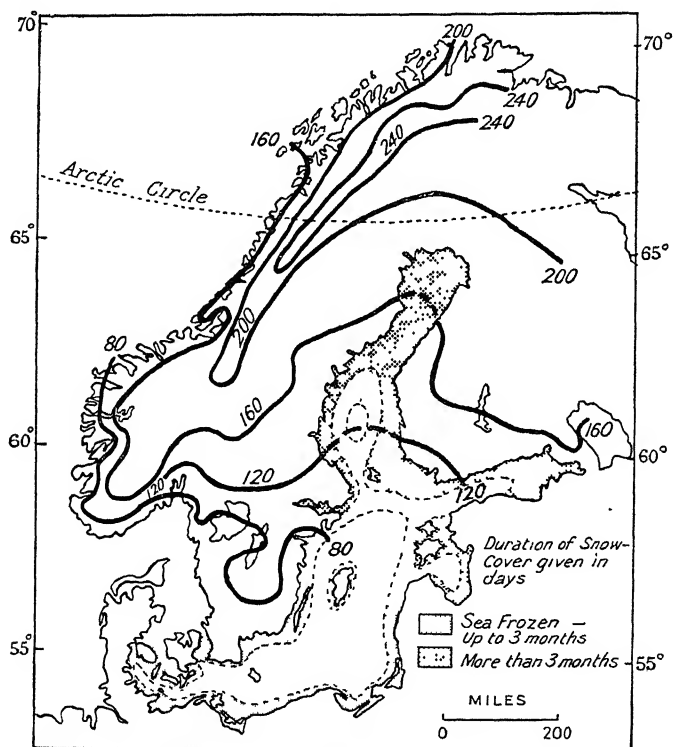


FIG. 62.—DURATION OF SNOW-COVER IN FENNOSCANDIA

based on a fundamental similarity of structure and to a less extent on climate.

The absence of coal kept Fennoscandia aloof from the Industrial Revolution in the nineteenth century, but the recent development of hydro-electricity is leading to an increase in industrialisation, and also is helping to conquer the "colonial" handicaps of great distances and small population.

Although the countries of Fennoscandia are broadly similar, yet there are certain divergencies in their dominant outlook. These

differences may be explained to a large extent by differences in position, as well as by certain contrasts in structure and relief which will be dealt with later on. The differences in position involve contrasts of climate and different contacts with other lands and

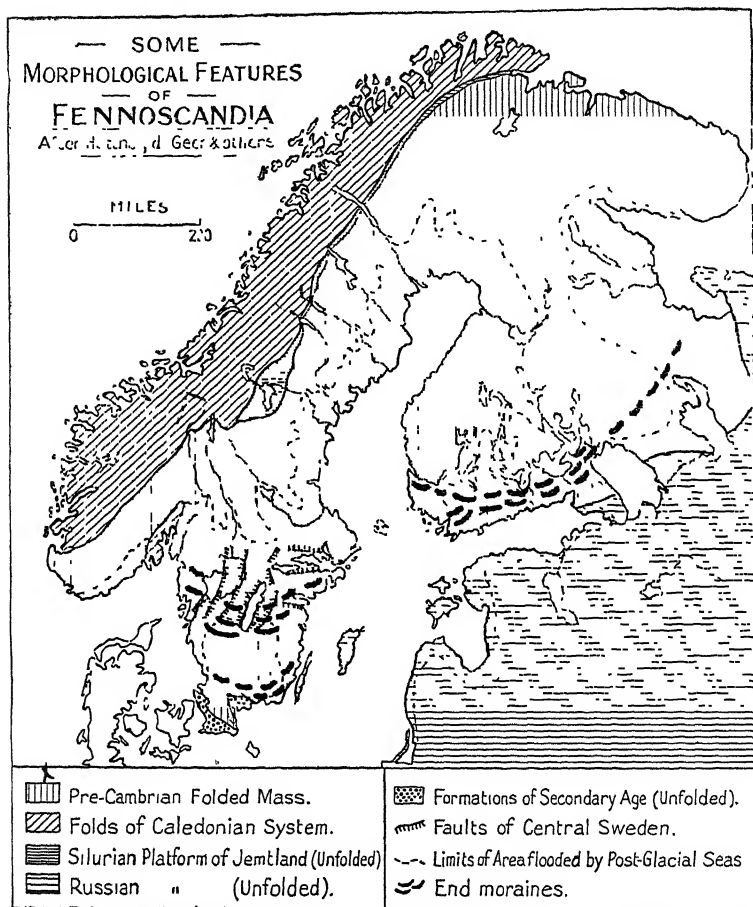


FIG. 63.—SOME MORPHOLOGICAL FEATURES OF FENNOSCANDIA.

The fine stipple represents the area flooded by Post-Glacial seas.

peoples. For instance, the position of Norway with regard to the open ocean and to rich fishing grounds has given that country better opportunities for developing maritime activities than are possessed by Sweden or Finland, since the Baltic is poor in fish and hampered by ice in winter, though Sweden's North Sea coast

gives her better opportunities than Finland in this respect. On the other hand, position combined with relief has given Sweden better opportunities for agricultural life than Norway, since in addition to wide lowlands, the climate is more favourable, being warmer in summer and always drier. Finland is less fortunately placed than either. In latitude she corresponds to the northern, less productive half of Sweden and has no ice-free coast, for her short stretch of coast along the Arctic Ocean has now gone to the U.S.S.R. Moreover, the country must be looked upon as historically more backward than Norway or Sweden, her remoteness from the early cultural centres and her close connections with Russia in the nineteenth century hindering her cultural development.

Structure. Fennoscandia consists fundamentally of an extremely ancient "shield" of Archæan or Pre-Cambrian rock representing the stumps of a mountain system that had already been peneplanated before Palæozoic times. This formation now appears at the surface in the whole of Finland, the mass of Sweden, and in most of the southern part of Norway, and underlies the rest of the area. On top of this ancient peneplain were spread sediments of later Pre-Cambrian, Cambrian, and Silurian age, which in the north-west of the region were folded in late Silurian times into another ancient, though relatively much younger, mountain system, belonging to what is known as the Caledonian system of folding. The name takes its origin from the Highlands of Scotland which belong to the same system. (See Chapter I.) This second mountain system stretches from north-east to south-west and forms the backbone of the present Scandinavian peninsula, though it is nearer the west than the east coast. Farther east the sediments remained unfolded and were denuded from Finland, eastern and southern Sweden, and southern Norway during the long period of subaerial erosion which ensued. Where folded, however, the sediments were piled so thickly in a kind of trough in the Archæan platform that even the prolonged denudation, from Devonian times to the present day, has failed to remove them, though in places the Palæozoic deposits have been worn so thin that the underlying Archæan rocks are revealed through "windows." It is clear also that overthrust masses of the Caledonian system extended somewhat farther east than at the present day, as evidenced by outliers.

The Caledonian mountain range in its turn was reduced to a peneplain, and the present great elevation of the chain is due to epeirogenic uplift, *i.e.* uplift *en masse*, at the end of the Tertiary period.

Between the end of the Devonian period and the Tertiary rejuvenation, Fennoscandia was probably a landmass, and at some time

during this long interval there occurred the complicated system of faulting which forms a characteristic feature of the geology of the area, though the precise age is uncertain. This faulting has left little to show on the surface, though it is largely through down-faulting that vestiges of the former unfolded sedimentary Palæozoic cover of the eastern and southern parts of Fennoscandia have been preserved.

The Tertiary uplift gave the rivers new erosive power, but though the ancient peneplanated surfaces now stand at greater heights than formerly, the general evenness of the skyline betrays their essential nature. In the highest parts of the Norwegian *fjeld*, or high moors,

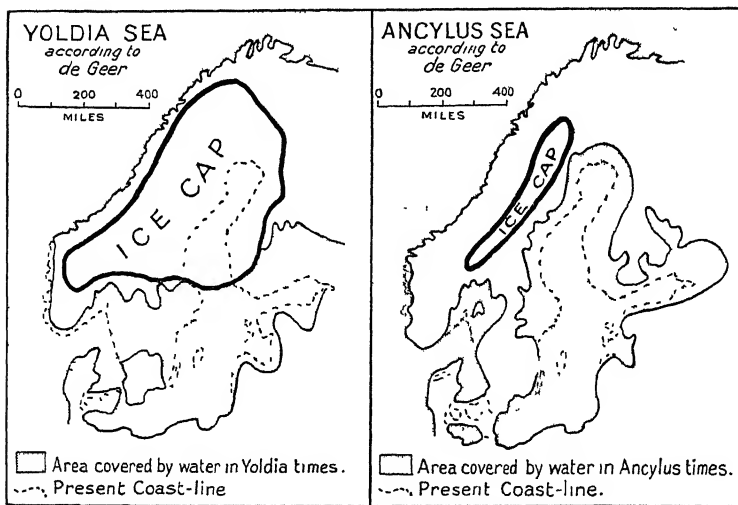


FIG. 64.—(a) YOLDIA SEA. (b) ANCYLUS SEA.

the rivers still flow in wide open valleys, and this feature, combined with the gently undulating character of these plateaus, shows that the rivers have not yet had time to attack the central mass of the peneplain. The great valleys of Scandinavia, especially those of Sweden, seem obviously consequent to the strike of the Caledonian foldings, and this may be either an ancient inheritance from the time when the mountain chain still existed, or may have been developed after the Tertiary uplift.

The Quaternary Ice Age is responsible for much of the detail of the present-day topography, and the disappearance of the ice-sheet is so recent that the glacial topography is still very little touched by subaerial weathering. There seem to have been at least two

great glacial periods, since at least one long interglacial period can be proved. Scandinavia was one of the centres of dispersion of the great northern ice-cap, and while almost all the phenomena connected with extensive ice action can be seen on the topographic map, the main result on the area, as far as human exploitation is concerned, was the removal of soil. It is true that a thin and patchy deposit of morainic material was left behind as the glacial cap retreated, and in the lower levels there are patches of ground-moraine seamed with eskers (Swedish, *as*, plural, *öser*), but the morainic material is only suitable for forest growth, not for agriculture, and almost all the fertile land is composed of post-glacial sediments, mainly clays, which were spread over the lowlands as a result of an extension of the Baltic in geologically recent times.

At the close of the Ice Age a negative movement of the land with regard to the sea caused the coastlands of Finland, Sweden, and southern Norway to disappear under the waves. (The southern shoreline of the Baltic was but little affected.) The enlarged Baltic, called by geologists the Yoldia Sea, from the fossils of a mollusc *Yoldia arctica*, extended also right across central Sweden in the region of the present lakes Vänern, Vättern, and Mälaren, thus communicating with the Skagerak and North Sea. The central part of southern Sweden, however, now known as Småland, remained above water as an island. A slight positive movement, particularly in the region of central Sweden, put an end to the broad channel mentioned above, which communicated with the Skagerak, and turned the Baltic into a fresh-water lake, known as the Ancylus Sea, named after the mollusc *Ancylus fluviatilis*. This lake, though smaller than the Yoldia Sea, was larger than the present Baltic and still covered the coastlands of Finland and Sweden, but only overflow channels allowed the drainage of water by the Skagerak. This stage was followed by the opening of the Danish Straits which caused the sea once more to become salt, and there was a gradual recovery of land to present conditions.

REFERENCES

The Baltic Region, by E. G. Woods (London, 1932), gives an account of Finland, Sweden, and Denmark, mainly from the physical point of view. *Etats Scandinaves, Régions Polaires Boréales*, by M. Zimmermann (Paris, 1933), in the *Géographie Universelle* series, devotes about half its space to Fennoscandia. Another useful volume is *Northern Countries in World Economy* (Denmark, Finland, Iceland, Norway, Sweden), Helsinki, 2nd edn., 1939. The periodical *Geografiska Annaler* contains articles in English and German, as well as in Swedish, on various aspects of the physical geography of Scandinavia. "Fenno-Skandia," in the *Handbuch der Regionalen Geologie* (1913-14), deals with the geology.

CHAPTER XIII

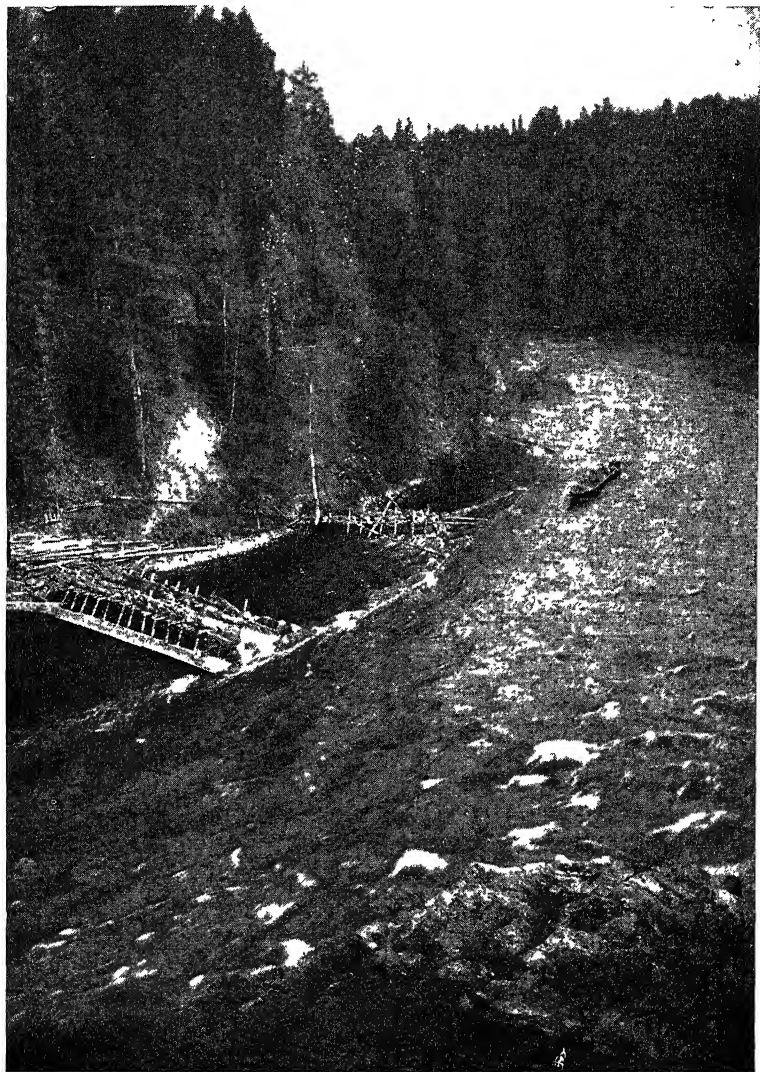
FINLAND

A POPULATION map of Finland, such as that given in the official Atlas of Finland, shows a striking concentration of people on the coastal regions, particularly those bordering the Gulf of Finland. Indeed, the northern half of the country may be looked upon as unpopulated, while even in the southern half the interior carries only a scanty settlement. It may be noted here that Finland lies in the latitudes of Alaska and southern Greenland, and that Helsinki, which lies just north of latitude 60° N., is the most northerly capital city in the world, apart from Reykjavik in Iceland. The scanty population, then, is largely explicable on climatic grounds, but the nature of the soil adds to the inhospitable nature of the country.

Finland lies almost entirely on the Pre-Cambrian or Baltic Shield, and consists of a peneplain of highly folded and faulted rocks of metamorphic crystalline character, together with intrusive igneous rocks, mainly granites. The ancient folds have no influence on the topography, and even the system of faults appears to be devoid of significance for the landscape, but the more resistant rocks, such as the gneisses, form the low, broad swellings which give the sole diversification of relief, apart from the superficial glacial phenomena. The Quaternary ice-cap in its advance swept the rocks bare of soil, and the material deposited by the retreating glacier, consisting mainly of gravel and boulders scattered sporadically, was unsuitable for agriculture. In consequence there is very little land suitable of cultivation, except in the coastal belt with its post-glacial marine sediments.

Although the whole country has a low relief, there is a certain amount of contrast between the physiognomy of the northern section of Finland, say north of 64° N., and the land to the south. South of that line we find the well-known Finnish landscape with its myriads of lakes and its chaotic river system. North of that parallel of latitude the river system is well defined and the land rises eastward from the Gulf of Bothnia up to a line of hills, known as the Maan Selka, which reach a height of over 1,000 feet in places. Little is known of this range, whose forested wastes pass into the tundra of Finnish Lapland, while even the broad forested coastal lowlands carry only enough people to bring the density up to 10 per square mile. A motor road was constructed during the 1920's through northern Finland to Petsamo (now Russian) on the Arctic Ocean.

Apart from this northern area, the rest of the country falls naturally into the lake plateau and the coastal zone.



[Courtesy "Finland Travel"]

FIG. 65.—OULU RIVER, FINLAND.

Typical of many rivers used for floating timber in Fennoscandia and Northern Russia. Note the logs and the log slides on the left.

The Lake Plateau is bordered both on the east and the west by low heights which branch off from the Maan Selka. On the south, however, it is shut in by a rampart of a different nature. Instead of a low swelling of the Baltic Shield, there is the steep, though not very high, wall of one of the best defined end-moraines in the world, known as the Salpausselka. This end-moraine, which in places forms a double wall, runs in a great arc parallel with the coast, at a distance of some forty miles inland. Within these low walls occurs the type of landscape which gave Finland its native name of *Suomi*, meaning "Lakeland" or "Swampland." Actually lakes cover about an eighth of the total surface of Finland and there are said to be sixty thousand of them. These lake hollows appear to have been actually gouged out of the solid rock by the great Quaternary glaciation, though their island-studded, branching character betrays the presence of eskers and morainic material. In many places the lakes have been transformed into swamps, and occasionally the process has gone still farther, so that the soil has been sufficiently drained for agriculture, mainly for pasture. This hummocky, lake-and-forest-covered surface, interspersed with patches of bare rock and occasional clearings, gives the characteristic Finnish landscape. Seen from a slight eminence which enables the spectator to look over the tree-tops, the skyline has the long even lines that betray the peneplain character of the area, which the accidented detail of the country tends to make one forget.

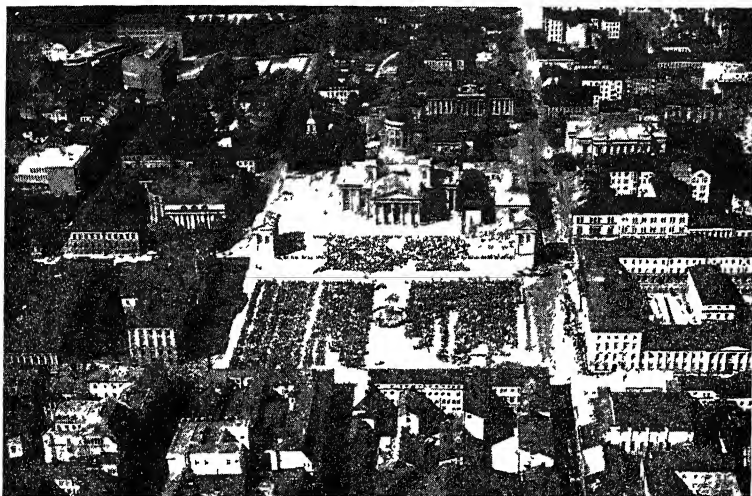
The water of the Finnish lake zone escapes by means of a few large rivers through the Salpausselka, generally by means of rapids, such as the Imatra rapids on the Vuoxen River draining to Lake Ladoga, or the "force" at Tampere (Tammerfors) in the west. Tampere (population 87,000)¹ is one of the few towns of any size in the interior of Finland, almost all the others being on the coast.

The Coastal Belt of Finland, especially in the south, has the advantages of better soil, better climate, and better access to the sea than the rest of the country. Originally covered with mixed forest, its marine clays provide reasonably good soils, though even here the stony heritage of the Ice Age is much in evidence. Climate and the cheapness of imported foodstuffs cause agricultural concentration on fodder crops, such as roots, hay, and oats. The dairy industry is important here as in the other Baltic countries. The shortness of the growing season is the greatest climatic handicap to agriculture, even in southern Finland. Summer is reckoned as beginning on June 24, when the rain is supposed to stop. In the middle of June the country still has a wintry aspect and crocuses are in flower. By the middle of July everything is in full bloom,

¹ Population figures are estimates for 1945.

and the meadow grass, abounding with scabious and other sweet-scented flowers, is ready for cutting. August is the season for collecting wild berries, such as raspberries, which owing to the severity of the winter are the only cheap fruit. Summer ends in early September and rain resumes until November, when the snow comes and conditions once more become pleasant. Winter is the visiting season, and the time for cutting the timber and dragging it over the snow to the frozen rivers, ready to be transported on the spring floods.

The coastal towns, Helsinki (Swedish, Helsingfors; 338,000), and Turku (Åbo; 81,000), handle the great timber exports and



[Courtesy "Finland Travel"]

FIG. 66.—HELSINKI (HELSINGFORS) FROM THE AIR.

manufacture timber products, such as wood-pulp and paper, using hydro-electric power, but Viipuri (Viborg; about 74,000), together with the land around it became part of the U.S.S.R. in 1940. As this port was the main outlet for timber by river and canal from the forested belt round Lake Saima, Finland's timber industry is likely to suffer in the future. Other manufactures are little developed, though textiles are manufactured in and near Turku, Helsinki, and Tampere. Helsinki is the capital city and a university town.

Historical and Economic Summary. Finland was conquered by, and integrated with, Sweden during the later Middle Ages. The Swedes brought Christianity and may be looked upon as the chief

civilising influence here, and many Swedes settled in the coastal belt, Åbo being the old capital under the Swedish régime. With the decline of Sweden as a great power Finland came under the rule of the Russian crown in 1809, but gradually lost the autonomy that had been promised. After the war of 1914–18 it obtained its independence, but in 1939–40 lost certain areas on the north, east, and south-east to the U.S.S.R., besides being forced to lease to that country a piece of coast west of Helsinki for the construction of a naval base.

Almost the whole wealth of modern Finland is yielded by its forests, mainly of pine and fir, which cover three-quarters of the land surface. About 90 per cent. of the exports consist of forestry products, timber, pulp, paper, etc., the remaining 10 per cent. consisting chiefly of butter. The country has a favourable balance of trade in normal times, in spite of the need of importing grain (and other types of foodstuffs), and many kinds of manufactured goods, such as textiles and machinery. The timber export trade is, however, apt to be threatened by the export of cheap timber from the U.S.S.R., which has much vaster resources.

REFERENCES

Farming in Finland, by W. R. Mead (London, 1953) is a very good book. *Atlas of Finland* (Helsinki, 1929), and *L'Agriculture de la Finlande en Diagrammes et Cartes* (1925) are two excellent official publications. See also E. Norden-skiöld's "Finland, the Land and the People" in the *Geographical Review*, vol. VII, 1919, and *The Finland Year Book*, Helsinki, 1937. Also W. R. Mead's "The Cold Farm in Finland" in the *Geographical Review*, 1951.

CHAPTER XIV

SWEDEN

FROM the point of view of settlement, Sweden falls naturally into two main areas. To the north of the Dal valleys lies the new "colonial" area of Sweden, though a few of the settlements date back to the fifteenth century, while to the south is the old settled countryside. The contrast is based on differences of climate, relief, and soils, the southern part being far more favourable to human habitation. Lying mainly to the north of latitude 61° N., northern Sweden may be looked upon as a land of forests and mines, a producer of raw materials, while southern Sweden is a land of farms and towns, of commerce and industry.

Northern Sweden corresponds in latitude to Finland north of the southern coast zone, and lies therefore north of the belt of mixed forest whose boundary runs just to the north of the Dal valleys. The severity of the climate, particularly the absence of light in the long dark winter, is a great handicap to development. For instance, it is difficult to get workers to stay for any length of time in the iron workings of Gellivaara and Kirunavaara, though this is an extreme case.

Structure and relief are both unfavourable to settlement except in very restricted areas. From the mountains of the Norwegian border the land slopes down to the Baltic Sea, usually in a series of steps. The mountains of the frontier region belong to the Caledonian system of folds and raise their wastes of *fjeld*, rock, snow, and tundra above the tree line. The overthrust masses of folded rocks here often overlie unfolded Silurian measures on the east and usually form an eastward-facing scarp. From the foot of the Caledonian system, roughly at a height of 1,500 feet, the old peneplain surface, mainly developed on Archæan rocks, slopes down towards the south-east. Rejuvenation has caused the rivers to deepen their beds, thus dividing the old peneplain into a number of isolated blocks. The presence of a long lake in the course of each river, roughly at the junction of the Caledonian mountain system with the Baltic Shield, produces a "glint line" which is sufficiently remarkable to call for some explanation. It seems likely that the lake basins were formed at a time when the retreating ice sheet lay to the east of the watershed. The melt-water is supposed to have been caught

between the ice barrier on the east and the mountains on the west and to have escaped westwards across the mountains by overflow channels. The lakes are of importance in the human geography of northern Sweden, as their drained portions and terraces offer better soil for cultivation than the surrounding land.

The mass of this dissected peneplain is covered only with an uneven deposit of coarse morainic material, unsuited to cultivation and mainly covered with a dense growth of coniferous forest. Many lakes exist besides those already mentioned, some being small rock

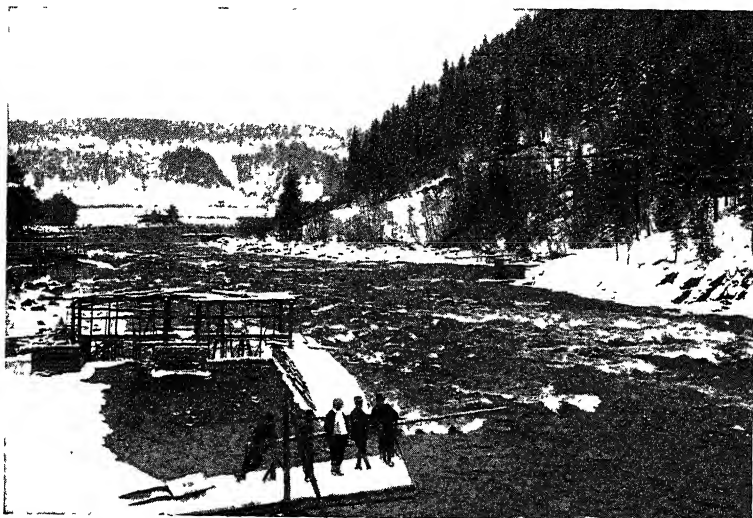


Photo: Bertie Norberg

[Courtesy Swedish Travel Bureau]

FIG. 67.—VIEW OF ANGERMAN RIVER NEAR SOLLEFTEÅ.

Note the terrace with habitations and clearings in the distance.

basins, some being dammed by morainic material, while others combine both of these features.

To the south-east of this infertile forest belt lie the alluvial sediments deposited in the Yoldia Sea and its successors. This strip is naturally of uneven width, extending deeply up the valleys and being much restricted elsewhere. The rivers have already begun to cut into these sediments owing to the lowering of the base-level, and have left broad, flat terraces of fertile soil, which are suitable for settlement and cultivation, and which have the further advantage of being near the sea. Conditions here are thus broadly similar to those in the Finnish coastal belt bordering the Gulf of Bothnia, and there is the same concentration of population, though the

density is nowhere high. Sten de Geer's population maps of Sweden on the unit-dot method give an excellent picture of the distribution of population.

A "fall-line" at or near the junction of the crystalline rock with the overlying recent sediments provides a useful source of power, which is used in the saw-mills of the coastal belt, though many of the mills now use saw-dust as a source of motive power.

The main prosperity of northern Sweden at the present day is based on the exploitation of its forests. The Baltic timber industry assumed large dimensions only after the Napoleonic Wars, although the trade in "naval stores" goes back much further. At first the saw-mills were at the fall-line and used crude water-power, but with the development of steam-engines, English coal was imported and the mills moved down nearer the coast. The more recent development of hydro-electricity has restored the falls to importance, though the mills have not shifted inland, owing to the greater ease of floating unhewn logs than of moving sawn timber or manufactured goods. The coastal region gets the benefit, therefore, not only from its own agriculture, but also as the manufacturer and exporter of the resources of the hinterland, and the latter industries are now more important than the former.

The iron-ore resources of northern Sweden are as restricted in area as those of the forest are dispersed. These ores occur in Lapland north of the Arctic Circle. The best known deposits are those of Kirunavaara and Gellivaara, but other considerable deposits exist. As a rule the ores are more or less intimately connected with rocks which are either definitely or probably eruptive, and the ore-bodies are now generally looked upon as magmatic segregations. The most important deposits are found in hill ranges (the crests of which sometimes consist of very high-grade ore), owing to the fact that these masses of dense magnetite resist atmospheric disintegration better than the surrounding rock. The word *vaara* is a Lapp word meaning "hilltop." The ore is mainly phosphoric and therefore was of little use before the invention of the Thomas and Gilchrist method of smelting. The iron-content varies, but in the ores now being worked it is above 60 per cent. and must therefore be classed among the richest in the world.

Owing to the unfavourable position of these mines and the expense of maintaining workers in such an isolated northern region, the ore is exported to other parts of Sweden or to other countries in order to be manufactured. Export was begun as recently as 1892, but was handicapped until the completion in 1902 of the railway to the Norwegian port of Narvik, which gave the ore an ice-free harbour.

Apart from the coastal belt and the Lapland mining area, one other region of northern Sweden deserves special mention, *i.e.* Jämtland or Jemtland, in the upper and middle basins of the Indals Elf (*Elf*=river). Here a wide band of unfolded Silurian material has been preserved through faulting, and gives relatively fertile soil. Its importance is enhanced by a through-route, which is now followed by a railway, connecting the valley with the fertile depression round the Trondheim Fjord.

Central and Southern Sweden. The heart of Sweden is the lakeland that stretches between the Baltic and the Skager Rak. The navigable waters of the lakes and the connecting rivers were useful in providing easy links between the two coasts, especially before



[Courtesy Swedish Travel Bureau]

FIG. 68.—IRON-ORE WORKINGS AT KIRUNAVAARA, LAPLAND.

The photograph was taken during a winter's day and shows work in progress.

the days of railways. The importance of this area is emphasised by the presence, at either end of the depression, of the two largest towns of Sweden, namely Stockholm¹ (690,000), which is twice as large as any other city of Fennoscandia, and Göteborg (325,000), which is the third largest city of Fennoscandia.

In southern Sweden the population is densest along the coasts, as is characteristic of Fennoscandia, though the coastal belt here is broader than usual. In the centre of this southern peninsula is a pole of dispersion, consisting of the rocky uplands of Småland, which stood above the waters of the Yoldia Sea, and which reproduce

¹ Population figures are estimates for 1947.

to a less severe extent the conditions of the Archæan slope of northern Sweden. In the extreme south-west of the southern peninsula is the region of Skåne, which belongs geologically to central Europe and which agriculturally is the most productive lowland of Fennoscandia.

Transitional between northern Sweden and the central lakeland is the basin of the Dal River and the uplands surrounding it. This area belongs physically to northern Sweden in many respects, yet its lower altitude and lower latitude, the Silurian measures round Lake Siljan, and the presence of minerals in the bordering uplands early attracted settlers. The mining belt lies mainly in the uplands separating the Dal River system from the central lakeland, but has an extension north of the Dal also. The only mineral mined in important quantities at the present day is iron, and although a variety of other metalliferous ores exist in small quantities, even the famous copper mines round Falun have now been abandoned. The iron-ore is both phosphoric and non-phosphoric. The latter, associated mainly with Dannemora, provides the material for much of the world's finest steel work, and is both used in the country and exported, especially to Sheffield. It was the high quality of this ore that laid the foundations of Sweden's mediæval fame as an iron worker. The phosphoric ores, associated mainly with Grangesberg, are present in larger quantities, but were of no consequence until recent years. (*See section on minette ores of Lorraine, p. 154.*)

The central Swedish lakeland presents a landscape rich in variation, in spite of the absence of great heights. The area is a mosaic of faulted basins, now mainly filled with marine clays or morainic material, where they are not still covered by water and swamp. There remain low horsts of the ancient crystalline rock which stand up above the surrounding landscape, and as these are useless for cultivation they have been allowed to remain covered with coniferous forests. Eskers are also numerous and are also forest-covered, and so too are the coarse morainic deposits.

Even in this favoured part of Sweden it was not an easy matter to bring the land under cultivation, since swamps had to be drained, forest cleared, and in many cases stones removed from the ground. The resulting landscape of lake and forest, meadow and moorland, arable land and orchard, is one of great diversification and charm.

Lake Mälär may be looked upon as the historic core of Sweden. The old royal residences of Sigtuna and Uppsala have given place to Stockholm as the modern capital, sometimes called "The Venice of the North." Situated on islands and on both banks of the narrows connecting Lake Mälär with the Baltic, Stockholm was a bridge town controlling the most important north-and-south routes

of Sweden, as well as being at the eastern terminal of the great east-and-west water route. Its position near the branching of the Baltic into the gulfs of Finland and Bothnia made it a good base from which to control the whole of the Baltic lands.

The second largest town of Sweden, Göteborg, has surpassed Stockholm as a seaport, partly because it faces the open North Sea instead of the enclosed and ice-hampered Baltic, and partly because it is accessible to large ocean-going ships, which are unable to reach Stockholm. Situated at the mouth of the River Göta, it lies at the western end of the sea to sea water-route *via* river, lake, and canal, and though this route is of little importance to-day, yet it



FIG. 69.—VIEW IN THE COASTAL PLAIN OF SWEDEN

Agricultural land on post-glacial marine clays, forest on Archæan bosses and on morainic material. Similar views are frequent in the coastal plains of Finland.

indicates the extensive hinterland of the port. The famous falls of Trollhättan, on the Göta River, are caused by a resistant block of gneiss. They operate a great hydro-electric power station.

The manufactures of the country are scattered throughout central Sweden, though southern Sweden also has a small share, but there is no great concentration of manufacturing conurbations in central Sweden such as is found in countries possessing large coalfields. The modern industries were mainly developed from local handicrafts which grew up where there was water-power and a local demand. The use of imported coal as motive power in the nineteenth century led to the coastal situation of the newer industries such as

cotton, mainly manufactured in and round Göteborg, where also the raw material was imported, but the recent development of hydro-electricity as the chief source of power means that industry can remain dispersed and that there will be no "Black Country."

In consequence of the dispersion of manufactures it is somewhat difficult to associate them with the names of towns, though Eskilstuna (49,000) is noted as the "Sheffield" of Sweden, Norrköping (80,000) is noted for its woollen industry, founded over two hundred years ago by Gustavus Adolphus, and Göteborg for cotton. Jönköping (41,000), within the wooded uplands of Småland, has large engineering works but no longer derives iron-ore from the Taberg.

Southern Sweden presents a different structure from central Sweden. The middle of the peninsula is occupied by the barren uplands of Småland, with granitic and gneissic rocks appearing at the surface. The picture presented is similar to that of Norrland, with moorland and forest predominating, but owing to the more favourable latitude some agriculture is carried on and the population is denser. Surrounding this upland lies the totally different landscape of the coastlands, with their fertile lowlands covered by marine clays, and with a correspondingly denser population. On the North Sea coast the population is notably denser than on the Baltic coast, owing to the addition of fishing as a means of livelihood, resultant on the nearness of rich fishing-grounds.

The densest population of all, however, about 270 per square mile, occurs in the rectangular peninsula of Skåne. The rock formations here include strata ranging from the Archæan to the Cretaceous, which are brought into juxtaposition with each other by means of a series of faults, striking from north-west to south-east. Little indication of the solid geology appears on the surface, however, apart from low swellings of gneiss which rise above the surrounding plain. The whole region is covered with a thick mantle of boulder-clay and is highly cultivated. The fertile soil and southerly latitude allow even wheat and sugar-beet to be successfully grown. The string of towns along the coast includes Malmö (177,000), a considerable port at the Swedish end of the train-ferry from Copenhagen, while Trälleborg holds the corresponding position in regard to the train-ferry from Germany. Lund (32,000) is an inland centre and university town.

Economic Summary. Fifty-three per cent. of the total land surface of Sweden is forest-covered, so that forest products naturally occupy a high place both among the manufactures and the exports. The trees are mainly conifers, and are very largely utilised for pulp and paper. A careful forestry management aims at keeping the annual

is cultivated, and the country is not self-sufficing in regard to food-stuffs, especially cereals, though there is some export of dairy produce. The large iron resources not only supply the home market but give a large surplus for export; for instance, the greater part of the 14-15 million tons mined annually is usually exported, and Sweden comes second in Europe as an exporter of this ore, France being first.

The development of manufacturing for export is very recent, apart from the timber trade. For instance, it was not until 1912 that the exports of iron and steel goods surpassed the imports of those commodities in value. Sweden is still not self-supporting as regards textiles, though becoming increasingly so. Owing to the high level of wages and the restricted home market, Sweden can compete on the world market only in "speciality" produce, with the one great exception of timber and its products. Besides wood-pulp, paper, furniture, joinery, and matches, Sweden exports such specialised products as those of the electro-chemical and electro-technical industries, together with labour-saving devices such as cream-separators, telephones, and ball-bearings. The imports consist chiefly of textiles and yarns, machinery and metal goods, coal, petroleum, colonial produce, and cereals.

REFERENCES

Sweden: Historical and Statistical Handbook, edited by J. Guinchard (2nd ed., 2 vols., Stockholm, 1914), contains much information on the economic development, but is now somewhat out of date. Sten de Geer's *Befolkningens Fördelning i Sverige* (Stockholm, 1919) is accompanied by a map on a scale of 1 : 500,000 showing the distribution of population, forests, industries, etc., and has an explanation in English. *The Agricultural Atlas of Sweden*, by Jonasson, Höijer, and Björkman (Stockholm, 1938), is a most valuable work. H. W. Ahlmann's "The Economic Geography of Swedish Norrland" in *Geografiska Annaler* (1921) gives an excellent account. See also W. Credner's *Landschaft und Wirtschaft in Schweden* (Breslau, 1926). *The Sweden Year Book* (in English) contains much varied information, and so does *Sweden*, published by the Swedish Traffic Association, 1938.

CHAPTER XV

NORWAY

NORWAY is at a disadvantage compared with Sweden, both as regards latitude and relief. Whereas the southern tip of Sweden is in the latitude of Newcastle, the southern tip of Norway is in the latitude of Inverness, and whereas the broad southern part of Sweden is occupied mainly by a wide, productive lowland, the broad southern part of Norway is occupied mainly by a high, barren plateau, while the narrow northern "tail" is almost wholly mountainous. The average density of population of twenty-three per square mile is lower even than in Finland and is actually the lowest in Europe, apart from Iceland. The interior of Norway is generally so mountainous that the population is almost entirely coastal, especially from the North Cape, $71^{\circ} 15' \text{ N.}$, to Stavanger, $58^{\circ} 58' \text{ N.}$ Only on the more gentle south-eastward drainage slope of Norway, from Stavanger eastwards to the Swedish frontier, does the population spread inland in a belt of any considerable width, and it is here that the bulk of the population is to be found.

As far north as the latitude of Trondheim the drainage of Norway is in two opposed directions from the great plateau-like *fjelds*. On the southern side the rivers flow to the Skagerak and on the northern in a west-north-west direction to the Atlantic. North of that latitude Norway consists of only a narrow strip of land draining to the Atlantic, the watershed forming the frontier with Sweden. Although this narrow northern strip of Norway can be subdivided still further, yet in a work on Europe as a whole it will suffice to consider it as a single region. The broad peninsular head of Norway, on the other hand, is sufficiently important and varied to demand subdivision, and three regions may be recognised, the interior *fjelds*, the south-eastern slope, and the western coast of the great fjords.

The Interior Fjelds. These great *fjelds* or high moors consist morphologically of peneplanated surfaces uplifted in late Tertiary times and since attacked with renewed vigour by the agents of denudation. The *fjelds* are developed mainly on the rocks of the Caledonian foldings, but also on those of the Archaean system, so that it is evident that the age of the formations is of little importance for the present topography. In places mountains rise above the

general peneplain level, and these owe their existence either to the great resistance to weathering of the rocks which compose them or else they are remains of an older and higher peneplain surface (*cf.* the peneplain surfaces in the Carpathians, Chapter XXVIII). For instance, the Snehätta Peak (7,544 feet) of the Dovrefjeld is developed in hard Archæan gneiss, while Glitretind and Galdhøpiggen (the highest mountains of Scandinavia, both just over 8,000 feet) on the Jötenfjeld are developed in gabbro, a heavy basic eruptive rock of great resistance and of an age contemporary with the Caledonian folding. These great peaks show Alpine features,



FIG. 70.—THE HIGH FIELD.

Winter-sports centre on the Voss railway. Note the peneplaned landforms of the plateau.

for during the Ice Age they stood above the ice sheet (*cf.* the *nunataks* of Greenland at the present day), and they accordingly developed cirques, sharp ridges, and the angular forms characteristic of such mountains. Alpine types are, however, quite exceptional, and most of the mountains form rounded bosses, similar to those of other high, denuded peneplains, *e.g.* the Highlands of Scotland.

The present cycle of erosion is still so youthful that there remain considerable areas of upraised peneplain scarcely attacked by the deepening of the river beds which has taken place in the lower and middle courses. Accordingly the high *fjelds* still retain the shallow valleys and meandering streams which date back to the days before

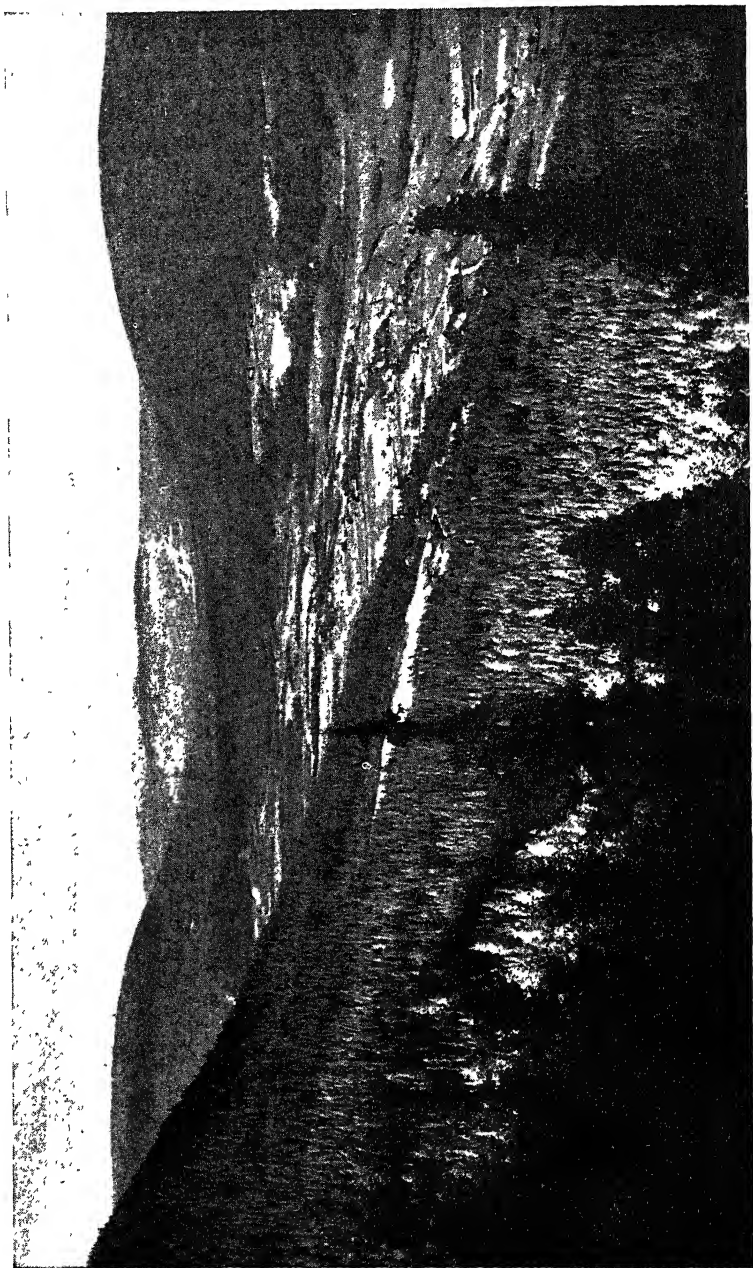
the Tertiary uplift (*cf.* the Plateau de Mille Vaches in the Massif Central of France, Chapter X). The margins of the *fjelds*, on the contrary, have been intricately dissected by U-shaped valleys, and as in the case of the Highlands of Scotland or the mountains of Wales, it is often difficult to recognise the existence of the former peneplain surface, though it is betrayed by the even skyline and uniform heights of the mountains.

The *fjelds* rise above the tree limit, which is here at a height of about 2,000 feet, and although there is a good deal of grazing for cattle in the short summer, yet the highest *fjelds* carry only a tundra-like vegetation, which was useless until the recent introduction of the reindeer industry from Lapland. Considerable ice fields are present in the highest *fjelds*, but great valley glaciers are few.

The South-Eastern Slope. The south-eastern slope of Norway, which drains to the Skagerak from the Hardanger Fjeld, the Jötun Fjeld, and the Dovre Fjeld, bears a marked physical resemblance to northern Sweden. Both slope in the same direction from the heights of the Caledonian fold system, *via* the Baltic Shield, to the coastal sediments deposited by the sea in post-glacial times. Similar rivers, in their trough valleys of glacial origin, are accompanied by similar lakes, and there is a similar sporadic covering of morainic material. The south-eastern slope of Norway is more favourable to settlement than the similar slope north of the Dal River in Sweden, owing partly to the more southerly latitude, partly to the extensive down-faulted area in the Oslo region, and partly to the fact that it drains to ice-free ports and to a sea rich in fish. The population is therefore considerably greater than in the morphologically similar strip in Sweden, even though the altitude is often higher in Norway.

Even in this favoured part of Norway, however, conditions are distinctly adverse to agriculture. Woods or forests form the background to every scene and many farmers engage in forestry in the winter months. Indeed, the mass of Norway's forest wealth of spruce and pine comes from the slopes between the *fjelds* and the lowlands of the south-east coast, for the west coast is usually too steep and wind-swept for much timber, though trees occur on the slopes of the inner fjords.

The Oslo region is the most favourable part of Norway for agriculture. This area has a rift valley structure and is separated from the Archæan region on the east by a marked fault escarpment and from the Archæan rocks on the west by heights formed of igneous rocks, associated with faulting. The Oslo region is also largely block-faulted within itself, and in such a manner that there



[Courtesy Norwegian State Railways]

FIG. 71.—RENDALLEN FROM HANESTADKJØLEN.

A valley of the "Eastern Slope" of Norway, but broader than many. Note the even skyline and the prevalence of forest and

is no large area of fertile ground even here, and patches of agricultural land alternate with forested or unproductive areas. Owing to the damp climate and short summer the arable land is mainly devoted to hay, though oats, barley, and potatoes are of some importance. Dairying is the leading branch of agriculture.

Oslo (289,000),¹ the capital, lies at the head of the sea-filled rift of the Oslo (formerly Christiania) Fjord and is situated not only in the best agricultural region of Norway, but also in the only area of Norway that has any degree of centrality. The great through-



[Courtesy Norwegian State Railways]

FIG. 72—VIEW OF SURROUNDINGS OF LAKE MJOSA, GUDBRANDSDAL.

This view in the "Eastern Slope" of Norway shows the close juxtaposition of tillable valley and forested heights. The grain in the foreground has been placed on wooden supports for drying purposes, a method adopted in many areas having a wet autumn, *e.g.* in the Swiss Alps.

valleys of Gudbrandsdal and the Glomma focus here and give the only easy through-routes from coast to coast. The great rivers of these valleys both rise in flat indeterminate watersheds which give easy saddles across the *fjelds* and lead down to the short valleys descending to the fjords of the western coast. It is reasonable to suppose that the through valleys were formed by heavy ice erosion during the Great Ice Age. The lie of the Scandinavian relief was against the path of ice currents from the Baltic centre of dispersal, which lay south-east of the present watershed, so that ice streams

Population figures are from the 1946 Census.

advancing towards the north-west over-rode the watershed, linked up valleys which had previously drained in opposite directions, and sometimes lowered the waterparting between them to such an extent that a low saddle resulted.

The chief development of manufacturing industries has taken place in the lowlands bordering the Oslo Fjord and the Skagerak. The older established industries are chiefly concerned with the working-up of timber and dairy products and with the canning of fish, especially herring, carried on extensively at Stavanger (49,000), though Haugesund (18,000) is the chief centre of the south coast herring fishery.

The modern electro-chemical and electro-smelting industries are primarily dependent upon the very large resources of water-power (see Fig. 75). Over half of Norway's hydro-electricity is developed in the valleys of the south-eastern slope, where there are numerous large power stations on the Glomma River, in Gudbrandsdal, and farther west in Numedal and in the Skiens catchment area (Telemark county). A wide range of electro-chemical products is obtained from the primary process of extracting pure nitrogen from the air, and from the manufacture of calcium carbide which needs limestone and carbon as raw materials. A few which may be mentioned are cyanamide (used for fertilisers and plastics), calcium nitrate, nitric acid, liquid ammonia, sulphate of ammonia, caustic soda, etc. Most of the nitrogenous derivatives are used either for agricultural fertilisers or for explosives. The two most important centres are Notodden and Rjukan, both in Telemark county. A few factories manufacture aluminium, electrolytic copper, nickel, steel, and ferro-silicon, etc., but there is less electro-smelting here than on the west coast, though more general industry; in fact the main "industrial belt" of Norway lies mainly in the Oslo depression, with sporadic extensions along the south coast, westward to Stavanger.

The Great Fjords. Controversy has raged over the origin of the Norwegian fjords and skerries. It may be mentioned here that in Norwegian the word "fjord" has no precise structural significance, but has much the same meaning as the Scottish word "loch," and the name is applied somewhat loosely to any kind of sea inlet whether the banks are low or high. It has, however, become the custom among geologists and geographers to restrict the word "fjord" to long, branching sea inlets with steep, high walls and submarine rock-sills at their entrance, such as are found on west coasts in high latitudes, as in Norway, Scotland, British Columbia, Chile, and New Zealand. Other sea lochs believed to be of similar origin but with lower banks have been termed "fjords," such as those occurring on the southern coast of Norway, from

Stavanger eastwards, and round the coasts of Sweden. The main difficulty in elucidating the origin of these fjords lies in the fact that much of the evidence remains hidden beneath their waters. It is generally held at the present time that fjords originated as river valleys which were over-deepened by glacial action and subsequently drowned. Some geographers, particularly D. W. Johnson, deny that drowning occurred, and point out that the ice could work below sea-level before being floated off as icebergs, and therefore attribute the great depth of the inner part of the fjords to the abrasive action of the great glaciers alone. Recent slight elevation has produced raised beaches, which provide some of the scanty lowlands available for human settlement. Accompanying the fjord coast



FIG. 73 —SIMODALEN, SHOWING A BRANCH OF THE HARDANGER FJORD.

Note the U-shaped valley and the even skyline. Those who know the English Lake District will notice the similarity of this view to that of Wast-water as seen from Great Gable.

of Norway is a somewhat discontinuous shelf of land reaching to about 100 feet high and of rounded and dissected form. The explanation of this comparatively lowlying land, the so-called "strand-flat," is also highly controversial, and equally so is the origin of the fringe of islands known as skerries. The skerries, which are low, hummocky islands sometimes strewn with morainic material, are not to be confused with the lofty islands which have only been separated from the mainland by glacier-filled tributary valleys of the fjord system. Many writers consider that the skerries and the strand-flats are remnants of a plain of marine denudation, but as the strand-flats are to be seen in places even inside the fjords,

where the action of waves would be negligible, recent writers have doubted this.

Fjord life is highly distinctive. The scarcity of lowland has concentrated attention on the sea, especially behind the sheltering skerries and in the fjords. There are good fishing-grounds inshore, particularly for herring, cod, salmon, and brisling, and there is practically no trouble from ice, in spite of the high latitude, owing to the warming influence of the Gulf Stream Drift. Up to recent years, however, there were few people engaged solely in fishing. The fjord economy south of Trondheim was essentially three-fold. Its essential basis was the small area of pasture or arable land near the coast on which was situated the homestead; this was supplemented by the harvest of the sea while an important contributor was the summer pasture centred round the *sæter* (mountain hut) on the *fjeld*, whither cattle and sheep were driven when the snow had melted (*cf.* the similar system of transhumance in the Alps and Carpathians).

Bergen (109,000) is the only large town of this area, apart from Trondheim, which is not quite typical. In fact, there is little opportunity for urban development on a fjord coast, owing to the difficulty of access by land, and the consequent absence of nodal points. Bergen itself had no hinterland at all until the recent construction of the marvellously engineered Voss railway via the Hallingdal, and this remains a tourist rather than a goods line. Bergen is the main centre of the fishing and shipbuilding industries. Trondheim (56,000) on the Trondheim Fjord has the great advantage of lying in a fertile depression, which coincides with the outcrop of a band of soft rocks in the Caledonian folds, a quite exceptional occurrence on the fjord coast. It is the centre of a small but productive agricultural region and is the oldest cultural centre of Norway. It also lies at the west end of a through-valley connecting it with Jämtland in Sweden, as well as at the north end of the Glomma route leading to Oslo. Both these routes are followed by a railway. Elsewhere, apart from a few small market towns and fishing centres and an occasional factory manufacturing electro-chemical and electro-metallurgical products, the population is very scattered, the single homestead being the normal unit of settlement. This extreme dissemination of population was very adverse to political unity, and together with the low density of population may explain long domination of Norway by her richer and better organised neighbours between the fourteenth century and 1905. Even the great factories, *e.g.* at Tysse and Odda on the Hardanger-fjord, which produce aluminium, zinc and chrome ore, employ very few people, in spite of their large output.

The Northern Strip. North of the Trondheim depression, which lies about 64° N., there stretches for 1,000 miles the northern strip or "tail" of Norway. Only six miles wide at its narrowest part east of Narvik, it is nearly one hundred miles broad in Finnmark, but its mountainous interior is almost entirely an unpopulated waste, apart from a few Lapps (called Finns in Norway), who pasture their reindeer on the scanty vegetation. The population is otherwise entirely coastal and largely in the islands, the mail-steamer providing the only regular means of communication among the small, scattered communities, which are almost entirely dependent on the sea for their livelihood. Narvik (10,000) is the Norwegian railhead and



[Courtesy Norwegian State Railways]

FIG. 74.—SVOLVAER FISHING HARBOUR, LOFOTEN ISLANDS

port for the Swedish iron-ore field of Lapland: the Kirkenes area and Nordland produce most of Norway's own iron-ore. Tromsø (11,000) is the seat of the whaling and sealing industry. Hammerfest, $70^{\circ}35'$ N., was the most northerly town in the world until the development of the Siberian Arctic ports. It was utterly destroyed by the Germans in 1945, when the whole northern strip was devastated.

Historical Summary. One of the most interesting aspects of the history of Norway concerns the exploits and migrations of the Vikings or Norsemen. Although the Norsemen came from Sweden as well as from Norway, those Vikings who changed the history of western Europe came mainly from the *vik* or "calm waters" of

the fjords. It is tempting to think of the Vikings being forced out to sea by the poverty of the land and attracted southward by the warmer climes of England, Normandy, and so on, but when it is considered that emigration from Norway of whatever kind was practically non-existent from the thirteenth to the nineteenth century, it becomes evident that other causes besides the geographical ones were operative.

Between the Saga Age and the twentieth century Norway suffered a long period of political eclipse. From 1319 to 1814 Norway was politically dependent on Denmark, and from the Napoleonic period onward was united to Sweden, and achieved independence only in 1905, a separation, it may be added, which was accomplished with the consent of the Swedes and without bloodshed. The extremely scanty and scattered nature of the population contributed to the long period of eclipse, since it rendered the concentration and the rallying of forces exceedingly difficult. Even to-day there are only three railways connecting the capital city with the long north-west coast. Exhaustion following the loss of man-power in the Saga Age may also be cited as a cause of the decline, though the slowness of recovery is not easy to explain.

Occupations and Industries. Owing to the great amount of emigration in the nineteenth century, it is reckoned that there are as many people of direct Norwegian extraction living outside Norway, mainly in North America, as inside it, and the present population of 3·3 million (1950 census) must be considered to approach the maximum which the country can support under present conditions, since only 3·6 per cent. of the area is capable of cultivation. There is a good deal of rural depopulation, and derelict farms may be seen in the poorer valleys, such as Saetersdal, where barren rocks and sandy soil alternate with bogs.

About 36 per cent. of the population live mainly off the land, from farming and lumbering, 30 per cent. are engaged in manufactures and mining, 15 per cent. in commerce and land transport, 6 per cent. in fishing, and 3 per cent. in shipping. The numbers engaged in fishing appear small in comparison with the importance of this industry to the country and to the publicity it has enjoyed, but the percentage given applies only to men who are engaged in fishing as their *sole* means of support, and these are much less numerous than those who engage in fishing as a part-time occupation; in fact, it is only since about 1890 that this new class of fisherman came into being, with the change-over from the old open boat to the decked boat, now mainly motor-driven. The fish (chiefly cod, herring, and brisling) come principally from in-shore waters and little part is taken in the North Sea fisheries, but more

than half the world's whaling industry is in the hands of Norwegians and is now carried on mainly in Antarctic waters. As regards the mercantile marine, the tonnage per head of population is the highest in the world and the part played in the national economy by the carrying trade is of great importance. Owing to the poverty of Norway's natural resources the ships are chiefly engaged in carrying goods between foreign countries, only about one-tenth being engaged in the Norwegian coastal trade and another tenth between foreign countries and the home country. Contrary to what one might expect, the Norwegian carrying trade is not of great antiquity, but dates back only to the seventeenth century, and is much younger, for instance, than the Dutch. Nowadays, with the supersession of wooden vessels and sail by engine-driven ships of steel, Norway is not in a good position for shipbuilding. As regards total tonnage, the Norwegian mercantile marine ranked fourth in size in the 1930's, though only two fleets, those of Great Britain and the United States of America, were really much larger. During the war of 1940-45 the Norwegian government-in-exile was able to pay its fighting forces, civil service, etc., by taxes imposed on its mercantile marine.

The Norwegian lack of coal and paucity of good iron-ores, together with the small size of the home market, have all conspired to prevent the development of modern large-scale industries, and it is only in the twentieth century with the development of hydro-electricity that Norway's great store of power has been tapped. This is used for every conceivable purpose, and as regards manufactures is the prime cause of the establishment in the country of electro-chemical and electro-metallurgical industries, particularly the manufacture of aluminium (though the raw material must be imported), of calcium carbide (though here again the necessary anthracite and coke employed must be obtained from foreign sources), and of nitrates from the air. The timber industry also employs large quantities of hydro-electricity. Apart from these two main branches, Norwegian industry is mainly concerned with the preparation of canned fish and fish products, such as cod-liver oil, and with the manufactures of machinery used in the above industries and of cans for the preserving industries. Almost all the metals used in these industries must be imported, as only pyrites and iron-ore are mined in any considerable quantities in the country. About a million tons of pyrites are produced annually (average 1934-38), chiefly from the Lökken mines, near Røros, about thirty miles south-east of Trondheim. Small deposits of copper exist and are mined chiefly at Røros on the Glomma railway line, and both copper and pyrites at Sulitjelma, which lies east of Bodø. Iron-ore is worked at Kirkenes in the extreme north, 1.5 million tons

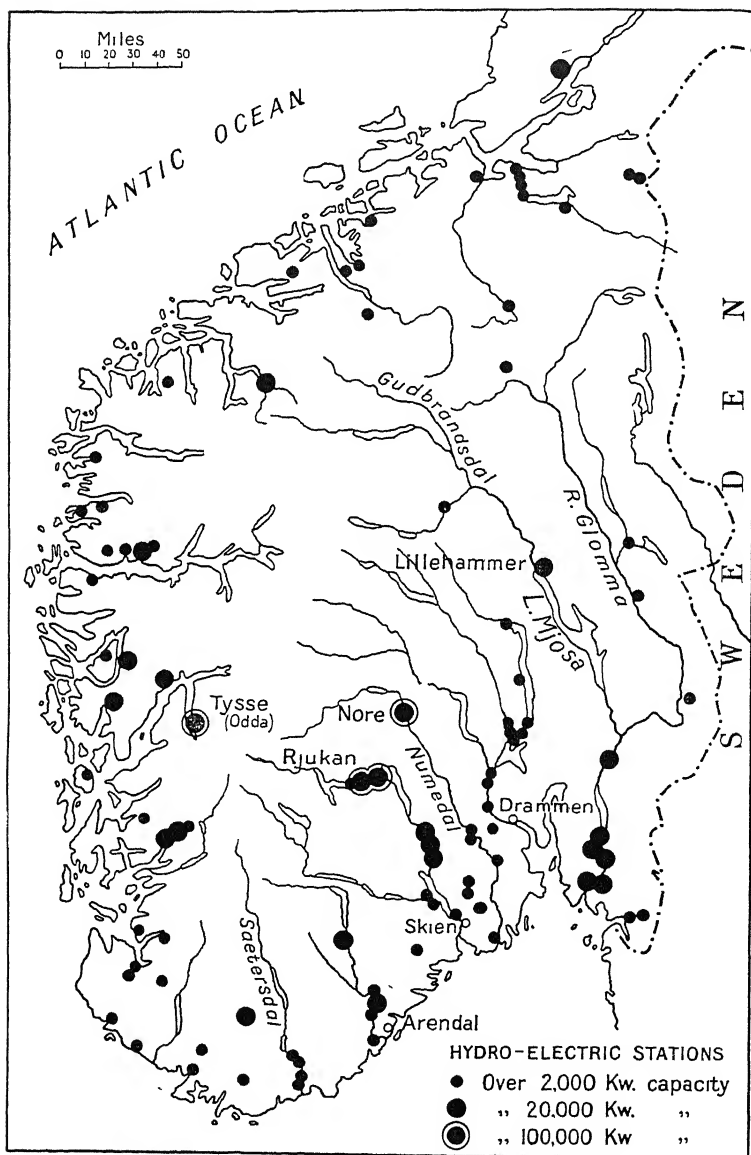


FIG. 75.—NORWAY: HYDRO-ELECTRIC STATIONS.

There is little development of hydro-electricity north of the Trondheim fjord, but large State installations are nearing completion on the Glom fjord and at Rössåga, in the Arctic Nordland.

being produced from this region in 1939. Norway possesses large quantities of iron-ore in many other areas such as Dunderland, but of such low iron-content that it did not pay to work these, until the adoption of new methods of concentration in the 1930's. As the ore is mainly magnetite, the method of magnetic separation can be employed. An iron and steel plant is now under construction at Mo i Rana, in Nordland, based on local ore and on hydro-electric power from the new generating plant at Rössåga. Norway is the only European source of molybdenum.

THE SPITZBERGEN ARCHIPELAGO (SVALBARD)

Norwegian sovereignty over these islands was officially recognised in 1920. The islands lie between 76° 30' N. and 80° 50' N., that is, in the latitude of northern Greenland, but they lie on the edge of the "Winter Gulf of Warmth" and feel the influence of the Gulf Stream Drift, so that although the subsoil is permanently frozen to a depth of 600-900 feet, the harbours of the west coast of Spitzbergen are accessible to shipping for six months of the year. The vegetation consists of tundra, and considerable ice-caps exist in North Island and Edge Island. The value of the islands lies mainly in the large deposits of good quality coal, of which about three-quarters of a million tons were exported annually. The deposits are worked on the west coast of the main island, chiefly at two concessions south of Ice Fjord. One of these is leased to the U.S.S.R. Mining is carried on even in winter.

REFERENCES

"Geomorphological Studies in Norway," by H. W. Ahlmann, in the *Geografiska Annaler* (1919), may be profitably consulted, though it gives more detail than will be wanted by most students of geography. See also "The Geomorphology of Norway," by K. M. Strøm, *Geog. Journal*, Vol. CXII, 1949; "The Physical Background of Norwegian Agriculture," by A. Sømme, *Geog.* 1950; together with the *Jordbrukets Geografi i Norge* (Geography of Norwegian Agriculture), Bergen, 1949. *The Norway Year Book* (in English), last issue, is a mine of information.

Per Nissen's *Ökonomisk-geografisk Atlas over Norge* (Kristiania, 1921) should be consulted if possible. See also "The Revival of Northern Norway," by D. H. Lund, in *Geog. Journal*, Vol. CIX, 1947; "High Latitude Flying by Coastal Command in Support of Convoys to North Russia," by Sir Philip Joubert and Lt.-Comm. A. R. Glen, in *Geog. Journal*, Vol. CVIII, 1946.

CHAPTER XVI

DENMARK

DENMARK is in the peculiar position of belonging on geological grounds to central Europe, on climatic grounds to western Europe, but in almost every other respect to northern Europe.

For purposes of comparison it may be said that Denmark is about half the size of Scotland, has a density of population about equal to that of Ireland, and resembles in climate and to a certain extent in landscape the eastern lowlands of England. The whole country is lowland, though the Baltic end-moraine runs northward through the peninsula of Jutland (*see* Fig. 77). The western side of Jutland is covered by the sandy outwash plain from the end-moraine, whereas the eastern side of the peninsula and all the islands are covered mainly by the boulder clay of the ground-moraine. The glacial material reaches a thickness of over 600 feet in parts of the end-moraine, but is usually much thinner, and in places the solid rock appears at the surface, in the form of (a) chalk on the coasts, *e.g.* of north-east Jutland and of the islands, (b) Tertiary sands and clays in the south-west of Jutland, and (c) granite in the eastern part of the island of Bornholm, which belongs geologically to the Scandinavian Massif.

The western coast is bordered by dunes similar to those of the northern Netherlands and similarly partly demolished and reduced to the North Frisian Islands in the south, but forming an almost continuous rampart along the coast farther north. Behind these dunes lagoons and marshes have formed, which add to the desolation of this western side of the peninsula with its naturally poor sandy heaths and harbourless coast. Through great efforts this unpromising western side has been improved and adapted to agriculture, mainly in connection with cattle-rearing, or where useless in that respect, has been planted with pine trees. The port of Esbjerg (43,000)¹ was created in consequence of the great trade of Denmark with the British Isles, for, paradoxically, though physically Denmark turns its back on England, economically it looks to that country as its chief market.

¹ Population figures are from the 1945 Census.

The morainic hills of eastern Jutland intermingle with the fertile soil of the ground-moraine. The highest point of Denmark, which is under 600 feet, lies near the east coast just north of Horsens. The coast is broken by a number of long inlets, which were apparently formed as valleys by melting water from the great ice-sheet and which were afterwards drowned. They are called "fiords" in Danish, but are totally different in origin and appearance from the Norwegian fjords. On the east coast, and usually on these inlets, are situated most of the towns of the peninsula, such as Aarhus (107,000), the second largest town in Denmark, Aalborg (60,000), and others.

The northern part of Jutland (Dan., Jylland) consists of varied materials, but largely of marine clays of post-glacial age (*Yoldia*), deposited when this part of Denmark was depressed beneath the sea. Sand and sand-dunes form the northern horn of Denmark, called Skagens Horn, known to English sailors as the Skaw.

The Danish islands, Zealand (Dan., Sjaelland), Fünen (Dan., Fyn), Laaland, and many others, at the shallow entrance to the Baltic Sea, represent the remains of a plain which was continuous between Jutland and southern Sweden as late as post-glacial (*Ancylus*) times, but which has since been partially drowned. The straits of the Sound, the Great Belt, and the Little Belt presumably represent drowned river valleys, and all of them offer difficulties to large modern ships, the Little Belt being in any case too shallow, the Great Belt having a very winding and narrow deep-water channel, and even the Sound, which is most frequently used, having a depth insufficient for the largest of modern vessels. It is, however, sufficiently deep for all except the ocean giants, and since it connects the North Sea and Baltic by the shortest route it has long been the most important, and consequently was an important factor in the growth of Copenhagen (Dan., Köbenhavn).

The Baltic islands of Denmark may be looked upon as forming the heart of the country. They mostly consist of very fertile soil developed on the ground-moraine, with only occasional morainic ridges of coarser material. The islands are supremely well cultivated and thickly populated, the main branch of farming being the production of dairy produce, bacon, and eggs.

The city of Copenhagen has an abnormally large proportion of the total population of the country, numbering 927,000 inhabitants out of a total of four million. It has been called the key to the Baltic, and in the hey-day of the Danish navy Denmark was able to block the entrances of the Baltic in time of war and to impose tolls (at Helsingör) in time of peace. It possessed a protected harbour on the narrow river-like strait between Copenhagen and

the island of Amager, and it may be noted that the main channel swings close to the western side of the Sound at this point. Copenhagen grew to greatness, however, when it was more centrally placed as a capital city than at present, since for many hundreds of years Denmark ruled the southern part of Sweden. Copenhagen stands at a crossing place of important land and sea routes, since the main land route leading from central Europe to Scandinavia here crossed the Sound. Since the construction of the Kiel Canal its position with regard to the entrance of the Baltic is less commanding. At the present day the city concentrates the intellectual, commercial, and manufacturing activities of the whole country.

The chief contribution of Denmark to modern Europe is the development of the co-operative system as applied to agriculture, especially to the marketing of agricultural products. Up to the 1860's Denmark was a country of mixed farming, producing cereals for export. The competition of the great prairies of Europe and America made cereal-growing unprofitable in this country of rather damp climate and small farms. The change in the agricultural system to co-operative dairy-farming was a deliberate step, planned by a few far-seeing men, and it was made possible by a great improvement in the educational system which was carried out at the same time. At the present day Denmark's agriculture is analogous to the large manufacturing industries of western and central Europe, since it depends to a large extent on imported raw material, in the form of cheap foodstuffs for animals, and it produces a number of highly standardised articles which are exported abroad. The co-operative system of marketing is especially helpful in this country of smallholdings, but it should be noticed that with the introduction of the modern dairying industry the number of small-holdings was greatly increased, as it was considered that a farmer and his family working his small-holding would give more care and attention both to quantity and quality than hired hands. Also the commodities of butter, bacon, and eggs, which are the export staples, are all foodstuffs which can be fairly easily graded and which keep fresh for a considerable time. Co-operative pooling and selling of these commodities inside the country has not met with success.

Denmark's example has been followed to a greater or less extent by all the Baltic countries, particularly Sweden and Finland, and between 1918 and 1939 by Estonia, Latvia, and Lithuania. The continued expansion of this system depends, however, on the capacity and the willingness of foreign countries with a large manufacturing population to continue importing foreign dairy produce. Great Britain is the chief market for Denmark, and in no conceivable circumstances could produce all the butter, bacon, and eggs needed

by its population of 49 millions, but under modern conditions of transport and cold-storage may easily import dairy produce from the distant agricultural lands of the Empire.

Denmark has few large manufacturing industries other than the agricultural ones, the lack of coal and water-power hindering their development, though there is a considerable number of small industries working for the home market and mainly localised in Copenhagen, of which the most noteworthy is shipbuilding, though the porcelain industry is better known abroad. The glove industry of Randers (36,000) is also well known. Three-quarters of the exports are animal products, and the imports consist mainly of cereals and other foodstuffs for the human population, fodder crops for the livestock, and manufactured goods such as textiles. The British Isles took two-thirds of the exports and is therefore easily first, but was behind Germany and U.S.A. as a provider of imports.

ICELAND

Iceland has been an independent republic since 1944, but formerly owed allegiance to the King of Denmark. It is situated between $63\frac{1}{2}^{\circ}$ N. and $66\frac{1}{2}^{\circ}$ N., and covers an area of 40,000 square miles. It lies within the "Winter Gulf of Warmth" and its southern coasts are rarely frozen. The main island consists of a plateau covered with young volcanic material from which rise active volcanoes, e.g. Hekla (5,107 feet). Both latitude and altitude are adverse to cultivation, indeed, ice-sheets cover the higher parts of the plateau, and only one-seventh of the land is classified as productive. Only one-quarter per cent. is actually under cultivation, which is confined to hay, potatoes, and turnips. The population numbers 144,000 (Census 1950), giving 3.6 per square mile, and is mainly concentrated on the coastal lowlands. The capital city and largest town is Reykjavik (49,000 in 1946) which is situated on the south-west coast. Fishing is the chief source of wealth, but perhaps the main importance of Iceland at the present day lies in its position with regard to air routes between North America and Europe, with all the strategic and commercial significance which this implies.

REFERENCES

Modern Denmark, by Hugh Jones (London, 1927), gives a good short account of the farming and economic life. See also *Denmark 1931* (published by the Royal Danish Ministry for Foreign Affairs and the Danish Statistical Department, Copenhagen, 1931); *Danish Agriculture*, E. Jensen (Copenhagen, 1937); and *Denmark, A Social Laboratory*, by P. Manniche (Copenhagen, 1939). See also *Atlas of Denmark and Notes* (Copenhagen, 1949).

SECTION IV—CENTRAL EUROPE

CHAPTER XVII

GENERAL INTRODUCTION TO CENTRAL EUROPE

THE concept of central Europe is a familiar one not only to geographers but to the general public. The region, however, cannot be said to possess any structural unity, since it is composed of three main morphological types, namely, a glaciated lowland in the north, worn-down fragments of the Hercynian system in the middle, and a young folded mountain system with included plains in the south. Climatically, it is true, there is a general similarity, since the whole region has cold winters with a mean January temperature below freezing, warm summers (c. 64° F. to 75° F. for July), and a fairly well distributed precipitation with a maximum in summer. Consequently there is a general similarity of natural vegetation and cultivated crops, but only very generally, since crops needing summer warmth such as maize and the vine, which flourish in the southern parts of central Europe, are unable to reach maturity in the north. Also, in contrast to the forest-covered plains of north Germany and Poland, the plains of south-central Europe were mainly prairie-like grasslands. In culture and language, also, there are wide divergences, since central Europe is divided between two main language groups, the Germanic and Slavonic, with certain smaller additional elements such as Hungarian, Turkish, and Romanian. As regards the stage of development, too, there is a great contrast between the modern up-to-date social and economic life of, say, Germany and Switzerland and the more primitive social organisation and economic life of, say, Romania and Bulgaria.

The interior position of this kernel or core of Europe is the key to the matter. Central Europe is, indeed, transitional between east and west, north and south, and is therefore more varied within itself than any of the other main regions of Europe. For instance, in relief it lies open to eastern Europe both in the Germano-Polish and the Romanian lowlands. Structurally, it has less of the monotony of Russia, but not the extreme diversity of western and southern Europe. Climatically, it is transitional between the wet

and changeable weather of western Europe and the more stable, drier, and more extreme climate of eastern Europe. Historically,

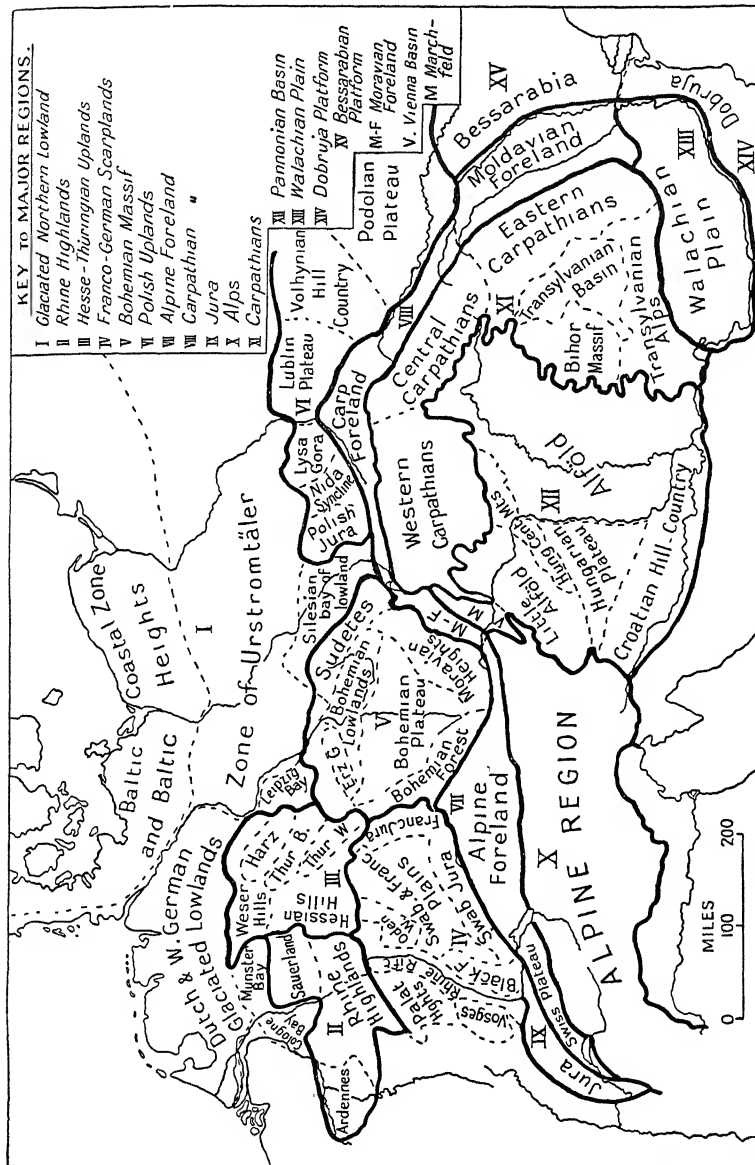


FIG. 76.—NATURAL REGIONS OF CENTRAL EUROPE (EXCLUDING THE BALKAN LANDS). Thick lines denote boundaries between major regions, broken lines denote subdivisions.

[After Machatschek

it came later into the civilised world than the southern and western margins of Europe, but earlier than eastern Europe.

In this great region, however, there may be distinguished two main sub-regions, of somewhat different climate and of considerable differences of outlook. The first, which may be called north-central Europe, is an area which by either latitude or altitude has generally cooler summers than the south-east, and where the precipitation is generally sufficient to produce a natural vegetation of forest. Here, also, are the German-speaking lands of Germany, Austria, and the greater part of Switzerland, which culturally may be considered as practically West-European and have a long tradition of high culture behind them. To these may be added the Slavonic-speaking Czechs of Bohemia and Moravia and the Poles, who have both been intimately concerned in the history of western Europe, though economically their countries are less developed. Opposed to north-central Europe is south-central Europe which historically has been bound up with eastern Europe. With its dry steppe-covered plains surrounded by mountains, but open to repeated invasions from the east, its development has been delayed in almost every respect. Both regions may be looked upon as essentially non-maritime, in spite of the development of Germany's navy and mercantile marine during the present century.

North-Central Europe. There are three structural elements in the build of north-central Europe. Of these the most widespread and continuous is the Germano-Polish lowland which stretches right across the north of the region and even across the frontiers of Germany into Holland on the west and Denmark on the north. On the east the Pripet marshes on the Polish-Russian border may be taken as the boundary of this lowland, and on the south it extends to the highlands of central Germany and the uplands of central Poland. The northern margin of these highlands and uplands runs from the Weser hills, along the Harz Mountains, Erzgebirge, and Sudetes, and thence along the Polish Jura, the Łysogóry, and Lublin hills; but there are many bays of lowland interrupting the higher land, especially in Poland, where many authorities would consider these löss-covered platforms as part of the lowlands. The whole lowland is covered with unconsolidated deposits resulting from the ice-sheets of Quaternary times.

The central highlands of Germany and the central uplands of Poland belong to the Hercynian zone, where the structure is dominated by the extensive stumps of the former vast Hercynian chains which were originally folded in late Carboniferous times. These stumps underwent elevation in the great positive movement of Tertiary times, and at the same time the overlying sediments were

often warped upwards, so that even where old rocks do not actually appear on the surface, the relief is affected by the Hercynian formation. The name is derived from the *Hercynia silva* or Hercynian forest of the Romans, a term applied vaguely to the forested mountains in the north of Bohemia, whence the name has been extended to apply to all similar massifs of the same age and origin. The Polish uplands belong structurally to this region, but were sufficiently low for the maximum advance of the ice-sheet to override them—at least, for a short period. The highest point reached in this zone of the central highlands and uplands is about 5,000 feet, but even the highest land usually shows the rounded land-forms which characterise the so-called block mountains of Europe. The central Rhinelands will be included here on structural grounds, although Alsace is politically French.

In contrast, the third region, that of the Alps, consists of great chains whose mighty peaks, covered with ice and snow, rise to a height of over 15,000 feet. The folded Swiss Jura may be included in this zone, and also the Alpine Foreland of Switzerland, Germany, and Austria, since it is built up of the waste from the Alpine denudation.

REFERENCES

A very full account, well illustrated by diagrams and photographs, is given in *Europe Centrale*, by E. de Martonne (Part I, Generalités, Allemagne; Paris, 1930, and Part II, Suisse, Autriche, Hongrie, Tchécoslovaquie, Pologne, Roumanie; Paris, 1931). *The German Lebensraum*, by Robert E. Dickinson (Penguin Special, 1943) deals with many aspects of the historical and economic geography of central Europe. *Länderkunde von Mitteleuropa*, by F. Machatschek (Leipzig and Vienna, 1925), gives a good short account dealing chiefly with the physical aspect, and contains an exhaustive bibliography. J. F. M. Partsch's *Central Europe* (London, 1903), though much out of date, contains some useful material.

See also, *Agricultural Systems of Middle Europe*, edited O. S. Morgan (New York, 1933), and *Manuel Géographique de Politique Européenne*, Tome I, *L'Europe Centrale*, by J. Ancel (Paris, 1936); *The West European City* (London, 1951) and *Germany* (London, 1952) by R. E. Dickinson.

CHAPTER XVIII

THE GERMANO-POLISH LOWLAND

Effects of the Quaternary Glaciation on Physical Features.

This lowland is covered with unconsolidated, superficial deposits laid down by great ice-sheets which spread out from Scandinavia in Quaternary times. These deposits consist of various kinds of glacial material, such as boulder-clay, morainic material, gravel, sand, and wind-blown löss, either deposited *in situ* or reworked by wind and water, and their thickness has been proved by borings to vary from about 40 feet to more than 600. Only very occasionally can the solid geology be seen through the covering mantle, as, for instance, in the gypsum outcrop of Sperenberg, or the muschelkalk of Rüdersdorf near Berlin, though the islands of Rügen and Heligoland both reveal the underlying rock in their cliffs of chalk and Bunter sandstone respectively. The deposits were evidently laid down on a pre-existing lowland surface composed mainly of Tertiary material, a fact which is of economic significance in connection with the deposits of brown coal in the southern part of the German lowland (e.g. in Nieder Lausitz, and near Leipzig and Cologne).

The lowland surface offered no obstacle to the successive advances of the great ice-sheet, whose greatest extension was stopped only by the mountains of central Germany and southern Poland, e.g. the Harz, Erzgebirge, Sudetes, and Carpathians. The later advance or advances, however, had evidently less momentum behind them and petered out in the plain itself.

Over the greater part of the Germano-Polish lowland east of the Lüneburg Heath (Lüneburger Heide), the glacial material is arranged in a number of concentric bands, which run mainly in an east and west direction, or more correctly, parallel with the generalised line of the southern shore of the Baltic. The plain immediately bordering the Baltic rises quickly to the Baltic Heights, which reach over 1,000 feet in places. South of these is a zone consisting of great shallow valleys alternating with bands of rather higher ground, and south of these again comes a löss-covered zone bordering the mountains. The lowland is not wholly devoid of relief, though there are large areas of flat land, both in and between the great valleys. West of the lower Elbe this concentric arrangement is not found and there is practically no break in the flatness of the plain.

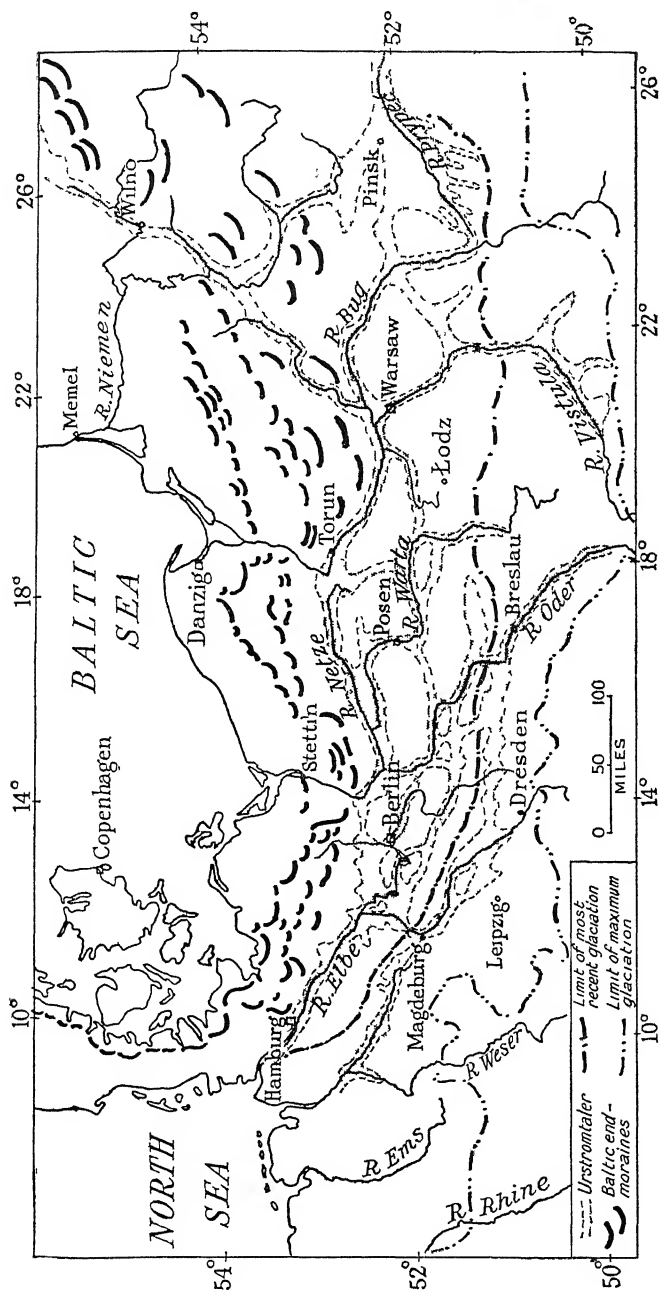


FIG. 77.—DIAGRAM OF THE GERMANO-POLISH PLAIN, SHOWING SOME OF THE MAIN ASPECTS OF GLACIATION.

There are three main types of deposits associated directly with those parts of an ice-sheet which are far from the centre of dispersion and which have reached low ground. First, there is the finely pulverised material of the ground-moraine beneath the ice. This is known as boulder-clay, which, as its name implies, is generally mixed with coarser material dropped from the body of the ice-sheet as it melts *in situ*. Secondly, if conditions are favourable for its formation, there is the end-moraine, which consists of very mixed material, including fragments of rock of all sizes, from grains of sand to large boulders, which have been carried in and above the ice-sheet rather than under it, so that there is much less finely abraded material than in the boulder clay. A terminal moraine is not, of course, a necessary accompaniment to an ice-sheet; in fact, it can be formed only when the rate of growth and the rate of melting are so nicely balanced that the edge of the sheet stays in one place for a prolonged period of time. Thirdly, there is the outwash material (*Sandr*) which the waters of the melting glaciers carry away with them, and which consists mainly of the finer particles from the end-moraine, particularly sand. A fourth type of deposit may be added, namely, the löss, but this is a product rather of the interglacial and post-glacial than the glacial periods. These periods were dry, so that steppe-like conditions prevailed over the unconsolidated material of the newly exposed surface. The loose, dry particles could easily be picked up by the wind, which carried them, no doubt, in different directions, but a large number of particles were arrested on the wetter southern margins, which here were along the northern foot of the mountains of central Germany and southern Poland. These löss deposits consist of very finely powdered yellowish material, on which fertile dark brown soils have usually developed. These, in turn, have allowed the development of very productive agriculture which contrasts remarkably with conditions over many other parts of the plain.

There appear to have been three or possibly four periods of advance of the great ice-sheet in the Germano-Polish lowland and two or three corresponding periods of retreat, in the last of which we are now living. These advances were of decreasing order of magnitude. The first advance, although it reached further south than the others, has left little impress on the present topography, either because time and weather have obliterated the marks of its terminal moraines or because no extensive terminal moraines were formed. The present topography of the lowland seems to be the result of the last glaciation, which was so recent, geologically speaking, that subaerial erosion has not yet had time to blur the work of the ice.

Zonal Topography East of the Elbe. South of the immediate coasts of the Baltic is the ground-moraine zone consisting of a belt of lowland covered with boulder-clay, similar in character to that of East Anglia, and similarly formed under the ice-sheet. The soil here is heavy and tenacious and generally fertile, but difficult to work. It was covered originally with deciduous forest, mainly beech. Southwards the land rises to the Baltic Heights, sometimes known as the Baltic Lake Plateau. Here, sand and gravel alternate with loams in a hummocky area, dotted with lakes, and traversed by typical end-moraines of coarse angular material. These are generally unsuitable for cultivation and retained under forest, consisting mainly of coniferous trees. The accumulation of morainic material in these Baltic Heights bears witness to the length of time during which the end of the ice-sheet must have rested here. This, however, was but one period of pause in the spasmodic retreat of the most recent ice-sheet, and there are a number of other end-moraines parallel to the Baltic Heights, though the more southerly ones are lower and more discontinuous. In front, *i.e.* south of each of these end-moraines, one would expect to find an outwash plain of sand, but matters were here somewhat complicated because, from the southern border of the glacier, the ground sloped slightly upward, so that the melt-water could not flow directly away from the ice face, but had to flow along its front for a long distance, until a lateral way of escape could be found. Moreover, the amount of water hemmed in between the ice and the mountains was augmented by the drainage from the mountains themselves. In consequence of the spasmodic retreat of the ice-sheet northwards, a number of these great east-west depressions were formed, and these great *urstromtäler* ("ancient river valleys"), as they are called in Germany, form a characteristic feature of the landscape of the greater part of the north German lowland.

In the Polish plain, where the east-west depressions are called *pradoliny*, they are far fewer in number and farther apart than between the Elbe and Oder. This seems to have been due to the different configuration of the country, with lines of higher ground running from south to north, and so preventing the easy lateral escape of water and leading to the formation of great ice-dammed lakes. Also there are fewer end-moraines in the Polish section of the lowland, particularly east of the Vistula and south of the Bug, which seems to indicate a more continuous melting or a smaller amount of debris.

Most of the *urstromtäler* of Germany and Poland do not carry any considerable quantity of water at the present day, for the supply

of water from a melting ice-sheet is no longer available. Nor, as can be seen from the map, do they form the main arteries of any water system. On the contrary, the main drainage is now generally from south to north. This diversion of the drainage evidently took place after the disappearance of the ice-sheet. Active erosion began on the part of short streams flowing to the Baltic Sea from the Baltic Heights. These evidently cut back their heads, and where conveniently situated south-flowing tributaries were met with, river capture took place; note the marked elbows of capture on the Oder east of the Havel-Oder Canal and on the Vistula at Bromberg. Similar elbows of capture can be seen farther south, e.g. on the Warthe at Schrimm, on the Elbe near Magdeburg, so that this process seems to have occurred at each main recession of the ice-sheet. Borings reveal marked valleys below the glacial deposits in the lower courses of the Weser and Elbe, as well as of the Oder and Vistula, and also in the upper (Silesian) course of the Oder, so that it seems possible that the development of the main streams of the present river system is guided in part by the pre-glacial topography. This is all the more likely as the general direction of the Oder, Elbe, Weser, and Aller follows the same south-east to north-west trend as the faults bounding the Sudetes, the Böhmer Wald, the Thüringer Wald, and Harz Mountains of the Hercynian system farther south. The *urstromtäler*, though no longer occupied by master rivers, yet afford admirable opportunities for the construction of canals. The floors of the depressions are usually marshy, though often partly choked by sand-dunes which were accumulated by the wind in post-glacial times. The particles are coarser than those of the löss, which were carried much farther. Owing to the present damp climate these dunes are generally no longer active, but are mainly covered with vegetation, particularly pine forest and heath, and the marshy tracts have mainly been drained, as they provide the most fertile soil apart from the löss. For long, however, the great marshy *urstromtäler* proved great barriers and offered great difficulties to settlers. Dutch and Flemish workmen carried out much of the reclamation in the *urstromtäler* both in Germany and Poland, and Frederick the Great is said to have "subdued a province in time of peace" by the drainage of the Oderbruch. The land between the *urstromtäler* offered even less promising material, since it consists mainly of the sandy outwash material and of the end-moraine itself. Unfortunately the retreat of the ice-sheet usually resulted in the fertile ground-moraine being covered up by the infertile material of the end-moraine and outwash sand, and only in a few places, presumably where the ice-sheet was not carrying a heavy load of coarse material, does the boulder

clay remain on the surface, though deep borings have reached two and sometimes three layers of boulder clay at increasing depths.

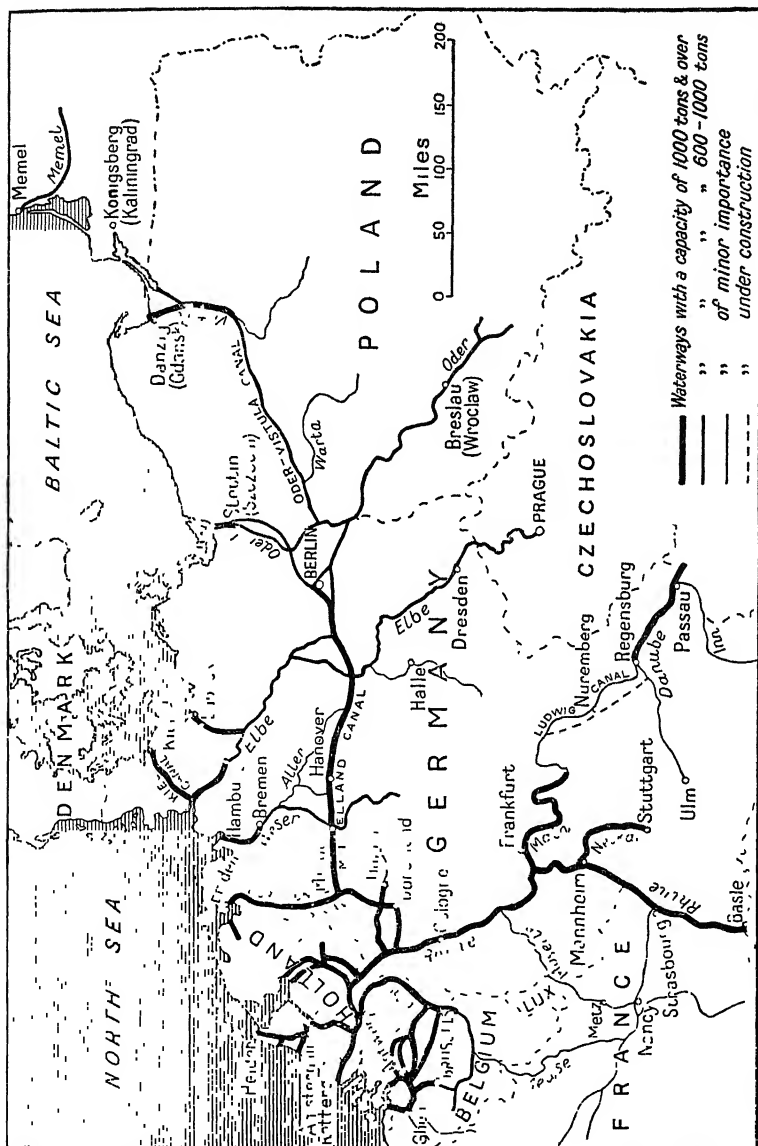


FIG. 78.—MAP OF THE INLAND WATERWAYS OF NORTH-CENTRAL EUROPE.

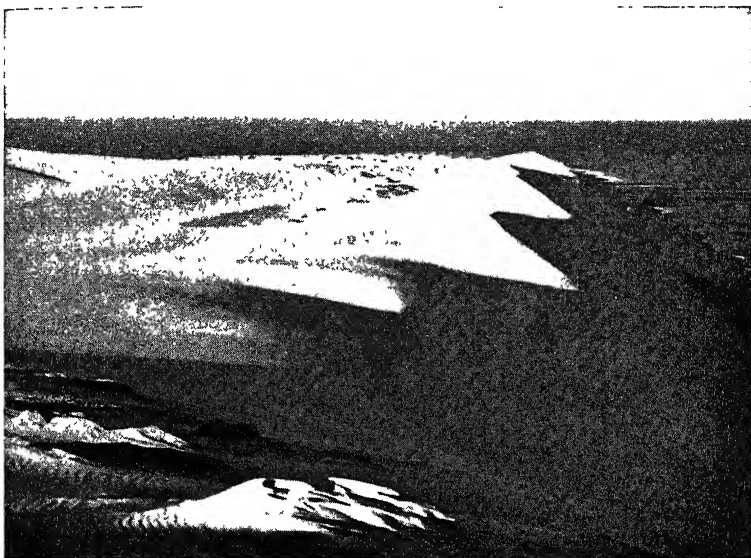
The discovery that the potash salts (*kalisalz*) of Stassfurt could turn this "sand-box" (*streusandbuchse*) into quite moderately good land created a revolution in the husbandry of the north German plain in the nineteenth century, and largely contributed to the wealth and strength of the kingdom of Brandenburg-Prussia, which was the main political unit of the plain.

The Baltic Coast. The actual coastline of the Baltic is largely a result of changes in the relative level of land and sea, rather than a direct consequence of glacial modelling, though some glacial features are discernible. East of the Oder, the Baltic coast is noted for its smooth outlines which are associated with the development of great dune-crowned sand-spits, here known as *nehrungen* (*cf.* French *cordons littoraux*) which were built up in front of a formerly indented coastline by the action of longshore drift and the prevailing south-west wind. The Frische Nehrung and the Kurische Nehrung are outstanding examples, and between these and the old shore lie great lagoons, namely, the Frisches Haff and the Kurisches Haff, and though in Pomerania the lagoons are smaller, yet most of these latter appear completely devoid of direct access to the sea (*cf.* the Landes coast of France). The coast, therefore, east of the Oder has comparatively few harbours, and no good ones by modern standards, with the possible exception of Gdynia. (*See* p. 300.) Glacial modelling is seen chiefly in the mouths of the Oder and Vistula, both of which appear to occupy the sites of former glacial "tongue-basins," which are depressions formed by lobes of the retreating ice-sheet (*cf.* p. 459).

West of the Oder, the coastline becomes progressively more articulated, and *nehrungen* diminish in length and continuity until they finally disappear. The maintenance of the old indented coastline is presumably the result of the feebler strength of winds and currents, and of the smaller quantity of available material, owing to the presence of the Jutland peninsula. Two types of coast are distinguished here, the *bodden* and the *förden*. The *bodden* coast includes the Oder mouth, and extends westward to Lübeck Bay, while the *förden* coast lies at the south-eastern side of the Jutland peninsula between Lübeck Bay and the Danish frontier. Both appear to be drowned coasts, but the *bodden* are irregularly shaped inlets in contrast to the long, straight-sided, deep *förden*. The *bodden* are formed behind on irregular breakwater of islands partially linked together by sand-spits, with the core of the islands varying from the chalk of Rügen to the glacial material of those at the Oder mouth. The *förden*, *e.g.* Flensburger Förde, Kieler Förde, Eckernförder Bucht, are believed to be drowned valleys, formed originally by rivers flowing beneath the ice-sheet (*cf.* the

fiords of Danish Jutland). They provided very good harbours until the days of really big ships.

Topography West of the Elbe. West of the Lüneburger Heide the same infertile sandy and gravelly soil is found, but there are no *urstromtäler*, and the region is generally a featureless plain. It is considered that the edge of the last ice-sheet did not extend beyond the Heath, and the region to the west is covered partly by the sand of the outwash plain and partly by sand of the older glaciations. Wide, infertile, dry, sandy regions called *geest* are intersected by the marshes of the river valleys and fringed by the marshes of the



[Courtesy German Railways Bureau, London]

FIG. 79.—SAND-DUNES ALONG THE SOUTH BALTIC COAST.

coast. The region evidently underwent subsidence at the close of the Ice Age, when the North Sea came into being and the English Channel was opened. The sea even invaded part of the present coastlands both in western Germany and Holland and penetrated the lower courses of the existing river valleys. It is possible that a slight uplift followed, but it is not necessary to postulate this to explain the present topography. Sandbanks were formed by the currents sweeping parallel to the coast and later developed into lines of dunes. Between the dunes and the shore were shallow lagoons, which gradually became largely transformed into marshes by being filled up with silt and by the growth of halophitic plants. It is

possible that further sinking took place, since the protecting line of dunes was later pierced by the sea and in the east was reduced to a string of islands, known as the West, East, and North Frisian Islands, the first of these being Dutch, the second German, and the last mainly Danish. Much of the marshland was again converted into shallow lagoons, known as *watten*, which are uncovered at low tide, and even the low-lying mainland was invaded by the sea to create the Jadebusen (eleventh century), the Zuider Zee (thirteenth century), and the Dollart (fourteenth century), which were all afterwards enlarged by further flooding. It is the tidal flats along the coasts and up the river estuaries which have been worth the trouble of reclamation by prodigious efforts of dyking and pumping, since they are covered with fertile silt, whereas the sandy soils of the mainland, though available without any such trouble, are so sterile as to be practically worthless.

Political Frontiers on the Germano-Polish Lowland. The lack of well-defined natural frontiers in the Germano-Polish lowland is no doubt one of the chief reasons for the historical tug-of-war across the plain between the Teutonic- and Slavonic-speaking peoples. Within historic times there have been extraordinary fluctuations of this frontier between the two types of speech. While it seems clear that Teutonic-speaking people occupied the plain during the later Folk-Wanderings (having replaced Celtic-speaking people), yet they migrated westwards and southwards, leaving the lowland free for the expansion of the Slavonic-speaking peoples, whose homeland appears to have lain east of the Vistula. Until the early part of the twelfth century,¹ the effective eastern frontier of the Germans was the River Elbe, but then began "that great eastward movement of conquest, colonisation and Christianisation, which under the ægis of bishop, monk, noble, and merchant, continued steadily for 200 years" (Dickinson). The German colonists set about clearing the forest between the Elbe and the Oder, and even beyond, to make room for agriculture, and they virtually introduced urban life, but these lowlands were not rich, fertile, smiling areas similar to the Paris and London basins. On the contrary, the poverty of the soil prevented the establishment of a political unit rich enough in natural resources and man-power to attract and dominate the other German political units, until (in the course of the late eighteenth and early nineteenth centuries) the marshes were drained and fertilisers applied to the sandy soil, both of the *urstromtäler* and

¹ The earlier conquests of Charlemagne, Henry the Fowler, and Otto I were followed by recessions, and in any case were conquests over the Slavs rather than large-scale German settlements. (See *Agrarian Life in the Middle Ages*, Vol. I of Cambridge Economic History of Europe, Cambridge, 1941).

the interfluves. Thus the ease of communication, which seemed to render this northern lowland an appropriate place for the early growth of a powerful state, was largely negated by the presence of sterile soils, while the lack of a nodal or focusing point, no doubt also proved an important negative factor. Indeed, the best focusing point of routes, which lay in the Brandenburg-Berlin area, was cursed with particularly sterile sands.

The partitioning of Poland in the late eighteenth century between Prussia, Russia, and Austria was to some degree, at least, a corollary of the lack of well-defined frontiers on the Germano-Polish lowland. The resuscitation of Poland in 1919-20 meant the loss of territory both to Germany and Russia, but was more serious in the case of Germany, as she possessed no extra-European area, whereas Russia had her vast Asiatic lands which were admittedly capable of enormous development. The recent (1939) advance of Russia westward to the "Curzon" line of Brest-Litovsk (Brześć na Bug), followed by the advance of Poland's western frontier to the Oder in 1945 is an historical reversal at the expense of Germany of much significance, especially when taken in conjunction with the partition of East Prussia between Russia and Poland.

CHAPTER XIX

GERMANY

Historico-Economic Foreword. Even before the *anschluss* with Austria in 1938, Germany was the most populous of the purely European countries, being second only to the U.S.S.R. among European powers, though in area she ranked fourth, being considerably smaller than France and slightly smaller than Spain.

In spite of territorial losses as a consequence of two world wars and a high number of fatal casualties, the German people are still numerically the second largest group in Europe, owing to the accession of German-speaking refugees from the territory east of the Oder, and from lands previously outside the political limits of the country, e.g. Czechoslovakia, northern Italy, and the former east Baltic republics of Estonia, Latvia, and Lithuania. Moreover, the fact remains that Germany is still an exceptionally well-endowed piece of the earth's surface, especially as regards the main requirements of industry; namely, abundant sources of mechanical power, a stimulating climate, and an excellent world position, to which may be added the presence of large numbers of intelligent and industrious people.

The phenomenal development of German agriculture, industry, and commerce, in the forty-seven years between 1871, when the German "Reich" or Empire came into being, and 1914, when she provoked the first world war, were achievements which won the admiration of all civilised lands, and contributed greatly to the wealth and prestige of Europe as a whole. Germany had been slow to adopt the methods of the Industrial Revolution, and before the middle of the nineteenth century she was lagging behind both the United Kingdom and France in the development of her resources, partly because her social and economic systems were very rigid, and partly because the German-speaking lands were split up into a number of smallish independent states, each with a restricted economic field and divided from the others by customs-barriers. The early years of the nineteenth century showed the first steps towards the establishment of a great modern state, with the break-up of the old feudal restrictions, and the establishment of a Customs' Union or Zollverein. By 1844 the Zollverein included all the German lands, except Hanover, the free Hanse cities (Bremen, Hamburg, and Lübeck), and Austria. The middle years of the

nineteenth century also coincided with the active development of railways, which facilitated movement over long distances, and helped to remedy the handicap of the inland position.

Germany was the last of the great European powers to achieve unity, and the extreme political subdivisions of the early years of the modern era prevented the Germans from reaping the economic and political benefits to which their numbers and skill might otherwise have entitled them. Once unity was achieved in 1871, with only Austria standing outside the new Reich, the way was open to the full industrialisation of the country and to the utilisation of its large and varied resources. In spite of a late start in the Industrial Revolution, Germany fully caught up with the industrialised western countries; indeed, in many ways she surpassed them, especially in the application of scientific and technical knowledge to the development of her resources, *e.g.* in the chemical industries, where progress is more dependent on research and powers of organisation than on natural endowment. Moreover, the State and higher educational establishments played more active parts in the development of industry than they did in France and England.

Between the middle of the nineteenth century and 1914, Germany experienced profound changes in its economic, political, and social life, which had repercussions on the whole of Europe and much of the rest of the world. The phenomenal development of industry was accompanied by a great natural increase in population, from 41 millions in 1871 to 65 millions in 1913. Thanks to improved methods of cultivation, these increased numbers were largely fed on home-produced food, only 20 per cent. of the necessary food-stuffs being imported from abroad. The country, however, became dependent on foreign lands for imports of many industrial materials, *e.g.* cotton, copper, and tin, and became increasingly dependent on foreign countries for marketing her manufactured goods.

The late emergence of German unity, together with her interior position in Europe, meant that Germany came late in the colonial field. In consequence, Germany appears to have laboured under a sense of grievance against the western European countries, in that the latter had obtained easily a number of valuable overseas possessions, capable of providing raw materials and of affording markets, while Germany obtained (late in the nineteenth century) only a few colonies in Africa and elsewhere, which were of no great value. An analysis of Germany's commerce shows, however, that about three-quarters of Germany's exports went to other European countries and half her imports came from other European countries, and with a world still mainly, in 1914, devoted to free-trade, there was at that date no real economic difficulty either in buying or selling

abroad, and, in fact, Germany seemed in process of obtaining the lion's share of world trade. However, under the belligerent leadership of Prussia, with a record of almost consistent success in warfare, conquest by war, no doubt, appeared to be a short cut to world economic domination and an assurance of obtaining raw materials and markets. With Germany's traditional hostility towards the Slavonic-speaking people, and the presence in south-east Europe of small, newly-emerged states, Germany chose to seek her expansion eastwards rather than westwards, a decision natural to a power which was stronger on land than on sea.

As a result of the war of 1914-18, Germany lost her overseas possessions, as well as most of her reserves of iron-ore (in Lorraine), and a certain amount of her coal (in Silesia). She was, therefore, in a worse position between the two wars than she had been in 1913, but by the vigorous exploitation of her lignite and the development of synthetic processes, she made a wonderful recovery. Unfortunately, the whole world was swept by a wave of economic nationalism, or autarchy, which hit all the European exporters of manufactured goods very hard. Whether Germany could have weathered the economic storm by legitimate means it is difficult to say, but instead she chose again to find a cure for her troubles in territorial expansion, the *Lebensraum* concept having been evolved by German exponents of *Geopolitik*, a pseudo-scientific study, which sought to find plausible geographic reasons for the aggressive policy of the state.

If the present *de facto* eastern frontier along the River Oder becomes a *de jure* frontier, Germany will lose permanently some of the most agriculturally productive lands of eastern Pomerania, East Brandenburg, East Prussia, and Silesia, as well as the whole of the Silesian coalfield. She will, therefore, become less of a central European state, and more like the states of north-west Europe, and will be much more dependent on imports of foodstuffs and on exports of manufactured goods, than she has been in the past. Needless to say, the division of the remaining lands of Germany into zones of occupation, and particularly the rupture between the Russian zone and the West, has prevented a resumption of normal trends, even in the remaining area (see map, Appendix G).

GEOGRAPHICAL REGIONS

Physically, Germany lies partly on the glaciated northern lowlands, partly in the diversified Hercynian zone (Mittelgebirge and Rhine rift valley), partly on the Alpine Foreland, and partly in the Alpine zone. (See Fig. 76.)

The Northern Lowlands

In spite of having relatively small areas over 600 feet in height, there is more variety than might be imagined at first sight. The lowlands fall into three main subdivisions (*see* Fig. 76), (A) a small area west of the Elbe, consisting mainly of an outwash plain, with its rivers flowing to the North Sea; (B) a large area east of the Elbe, with its physical features arranged in concentric arcs parallel to the Baltic coast, and lending itself to subdivision into (i) the Baltic coastal zone and Baltic Heights in the north, and (ii) the zone of *urstromtäler* farther south; (C) a transitional southern strip or border with "tongues" of lowland extending southward into the mountainous zone of Central Germany. These tongues have been termed the Cologne, Münster, Leipzig, and Silesian "bays of lowland." In contrast to (A) and (B), this last division is mainly covered with fertile soils, largely developed on löss, and is a region of ancient settlements with a high density of population.

(A) **West of the River Elbe.** The lowland is here at its narrowest, the distance between the Jadebusen and the Weser uplands south of Minden being about seventy-five miles. In this generally featureless area variety is provided mainly by differences in land utilisation, which are based mainly on differences of soil. There are three types of landscape in this area, (i) the reclaimed land called *marschen* along the coast and river estuaries, (ii) the bogs developed on excessively flat parts of the mainland owing to the lack of gradient and called *moore* ("moors" or "bogs"), and (iii) the heath lands of the higher and drier sandy stretches called *geest* ("infertile"). Human activities are mainly concentrated in the first of these regions, especially on the river estuaries of the North Sea coast. The whole region lies in the British zone.

The Geest. The *geest* is divided into two parts, the larger and higher section, known as the Lüneburg Heath (Lüneburger Heide), lying between the Elbe on the east and the Weser-Aller line on the west, while the smaller and lower section lies between the Weser and the Ems. The Lüneburger Heide seldom exceeds a height of about 350 feet, and its surface is often quite flat and rarely more than undulating, though its sides are rather steep where it descends to the valleys of the Elbe and Weser. Although the outer edge of the last ice-sheet probably reached here, the Heath shows but few traces of end-moraines except in the north-west and the south-east. The highest part (Wilserder Berg, 550 feet) has been set aside as a national nature-park and wide tracts of the Heath have been planted with coniferous trees in recent years. The scanty population wrings a hard livelihood from the infertile soil, but there are supplements to the food supply in the form of honey, rabbits, and an abundance

of game birds. Rather better soil is found in the infrequent valleys. The section west of the Aller is similar, but smaller and less continuous, being encroached upon by bogs and by the alluvium of the river valleys.

The "Moore" or Bogs. These peat-bogs have an appearance very similar to those of Ireland. They are similarly caused by lack of drainage. Two types are distinguished: those at a considerable elevation, where the peat appears dry on top but in reality is sodden with water, and secondly those at lower levels, which are often partly water-covered. Wide areas have been reclaimed within the last eighty years by the Dutch system, involving drainage and removal of the peat, the enriching of the underlying sand with this product, marling and manuring, and the addition of silt dredged up from the rivers. The new agricultural settlements on the moor are called *Fehnkolonien* ("fen-colonies"), and the farmers cultivate potatoes, green vegetables, some cereals, and are engaged in cattle-rearing. The peat itself is burnt for domestic use or converted into electric power.

The North Sea Coast of Germany. The sea coast and lower courses of the Elbe, Weser, and Ems are bordered by reclaimed lands which have been gained from the flood by means of dyking and drainage. These *marschen* carry chiefly meadowland for cattle and horses, but also grow sugar-beet and vegetables in the parts quite free from salt, Hamburg in particular making a large demand for market-garden produce. The rich soil of the *marschen* supports a large farming population, in spite of the danger of living below the level of high tide.

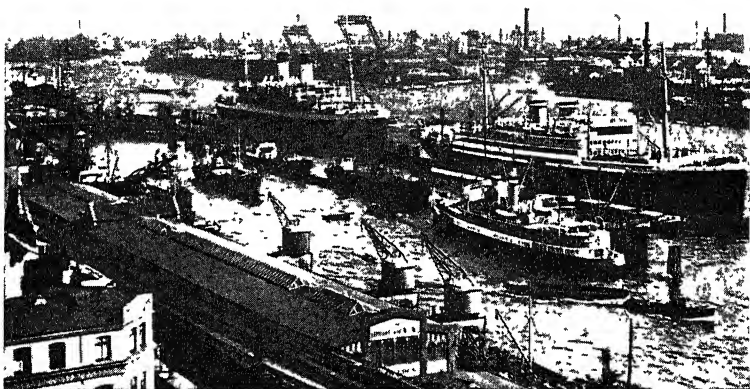
Between the coast and the dune-covered islands, with their sandy beaches and holiday resorts, are the tidal flats or *watten*, which are dry at low water except for channels of greater or less depth where rivers, great and small, cut across them to the sea. It is obvious that the only means of entry for shipping is up the estuaries, which fortunately are numerous in relation to the length, or rather the shortness, of the coast.

Although the North Sea coast of Germany is less than 100 miles long (as the crow flies), yet it was much more important than her erstwhile Baltic coast, mainly because it has direct access to the open ocean and is very little troubled by ice in winter. No port on the Baltic coast could compete with Hamburg, which has a population of over one and a half million¹ and was the leading port of the

¹ Population figures for towns of more than 1,000,000 inhabitants are based on the 1950 Census; otherwise figures are from the 1946 Census for towns in the British and American zones, except where indicated, and from the 1939 Census for towns in the Russian and French zones. Most of the towns suffered a marked decrease of population between 1939 and 1946.

mainland of Europe in pre-war days, and the third largest port in the world.

Hamburg was a self-governing city and a member of the old "Hanse" or league of free German cities that dominated the trade of central and northern Europe in the later Middle Ages. The town grew up on the Alster, a right-bank tributary of the Elbe, where the firm ground of the *geest* offered a dry site. It profited, like Liverpool, from the discovery of the New World of America, especially after that continent was opened up to international trade



[Courtesy German Railways Bureau, London]

FIG. 80.—PART OF HAMBURG HARBOUR.

Owing to the small amplitude of the tide, there is no need of enclosed basins with lock-gates.

in the late eighteenth and early nineteenth centuries; but its most rapid growth came later with the extension of the power of Prussia and the unification of Germany under the Empire. Naturally, also, the increased agricultural productivity and the accompanying increase of population in the North German lowland greatly enhanced the importance of its hinterland.

Hamburg entered the German Zollverein as late as 1888, but retained many privileges right down to the 1930's, including its free port, whose freedom from customs duties enabled it to become a great entrepôt like London.

At the present day the city not only extends to the Elbe, but also has its newer quays on the farther, *i.e.* southern, side of the more

northerly channel, in the islands of the estuary, at Wilhelmsburg, and on the southern bank of the more southerly channel at Harburg. Here the soft alluvial *marschen* made excavation easy, whereas the firmer sand on the high right bank made harbour construction difficult. Owing to the small amplitude between high and low tide, averaging only 6 feet 6 inches, there is no necessity for lock gates to the basins, so that no time is lost on arrival or departure for this reason. The port is actually about eighty-five miles from the first Elbe lightship, which is taken as the mouth of the estuary, but dredging has given a channel deep enough for the largest vessels afloat and some of the basins have a depth of 36 feet. Its outport of Cuxhaven, however, was built for passenger traffic, since the slow eighty-five miles journey up the river wastes half a day.

The hinterland of Hamburg prior to 1939 comprised all the land drained by the Elbe and its tributaries, including the Bohemian section of Czechoslovakia and the canal system between the Elbe and Oder. The River Elbe was the main highway for the movement of goods to and from the port until the network of railways became fully organised. Nearly half the goods-traffic was river-borne in 1938, and inland navigation was considered sufficiently important to warrant the construction of the new Mittelland Canal connecting the Elbe westward with the Weser-Ems-Rhine system, and so to link up the two main inland-water systems of Germany, which were formerly isolated from each other. Its hinterland is now (1949) greatly reduced, as the frontier of the Russian zone is only some 20 miles away.

Besides being a port, Hamburg was also a manufacturing centre, especially concerned with shipbuilding and engineering. Various other industries were carried on, particularly in Altona, Harburg, Wilhelmsburg, and Wandbek, which form part of the Hamburg conurbation, but lie outside its administrative boundaries. These industries were mainly concerned with processing imported raw materials, such as mineral and vegetable oil, rubber, grain, and the agricultural produce of the surrounding countryside.

The other two North Sea ports of Germany are Bremen (390,000) on the Weser and Emden on the Ems. The former is an older port than Hamburg, but its growth was hampered through its being on a smaller river, therefore having a smaller hinterland, and also because its estuary is shallower and narrower than Hamburg's. With its outport of Bremerhaven, which is accessible to the largest liners, Bremen was the second largest port in Germany, and, like Hamburg, was a free (Hanse) city. Its commerce was rather more specialised than that of Hamburg and it was the chief Continental cotton market and importer. Bremerhaven, together with Wesermünde, was the leading fishing port of Germany. The port of

Emden was created with the object of capturing some of Rotterdam's traffic for Germany. It has the advantage of being connected with the great coalfield and industrial area of Westphalia by means of the Dortmund-Ems Canal (built 1892-8), and attracted to itself a large traffic, particularly in iron-ore and timber from Scandinavia, besides its exports of coal from the Ruhr.

The North Sea ports of Germany were engaged in pre-war days in importing goods from all over the world, in contrast to the German Baltic ports which mainly dealt with goods from across the Baltic. Also the North Sea ports handled the greater part of the overseas passenger traffic of the country.

(B) East of the Elbe. The parallel arrangement of the main lines of relief has already been mentioned, and an explanation given of the main features of the topography. (*See pp. 247-251.*)

The Baltic Ports. West of the Oder, along the *Förden* and *Bodden* coasts (*see p. 250*), there are many inlets associated with famous old ports, but the coast as a whole is less important than the North Sea coast, owing to its position off the main lines of commerce and to its relatively severe winters. The necessity of making a detour round the 250 mile-long Jutland peninsula, or alternatively of paying the heavy dues through the Kiel Canal, has handicapped the Baltic ports in recent centuries as compared with those of the North Sea coast. Moreover, physical conditions in the Baltic conspire to render its ports more liable to freeze. Not only does the more easterly position produce more Continental, *i.e.* colder, winters, but the Baltic Sea is so cut off from the open ocean by the shallow sill on which the Danish Archipelago stands that it receives very little salt ocean water and has practically no tide. On the other hand, it receives large quantities of fresh water from the many rivers which flow into it, so that the coastal inlets, on which most of the harbours stand, contain almost fresh water and therefore freeze more easily than if they were salt (*cf.* *Frisches Haff*=fresh-water haven). While the North Sea ports seldom have any trouble with ice, Stralsund is subject to freezing for 27 days per annum on an average, with wide fluctuations from year to year; navigation actually came to a standstill for over a month in the three consecutive years of 1940-1-2, while in 1947 the period of severe freezing was even longer. It is not surprising, therefore, that the total annual tonnage of all Germany's Baltic ports added together was less than half that of Hamburg during the 1930's, the last period when trade approached normality.

*The Förden Coast of Schleswig-Holstein.*¹ Along the Baltic coast of Schleswig-Holstein are numerous ports, situated at the head of long

¹ In the British zone.

inlets or *förden* (see p. 251). They vary in size from Schleswig (about 20,000) and Flensburg (100,000), to Lübeck (224,000) and Kiel (213,000). Kiel is the only one which possesses deep water. It was Germany's main Baltic naval base, and stands near the entrance of the Kaiser-Wilhelm or Kiel Canal, whose depth of 36 feet enabled it to take the largest battleships. It was built by Germany mainly for strategic purposes to connect the North Sea and Baltic through German territory, and so avoid the channels through the Danish islands. Traffic through the canal amounted to about 16,000,000 tons in 1934. Kiel itself had graving-yards and a fishing industry.

Lübeck, on the River Trave, was formerly the leading member of the Hanse. Its shallow harbour, and in modern days its unfavourable position as compared with the North Sea ports, have caused its decline, though it trades with the Baltic countries through its outport of Travemünde. The picturesque old town had acquired industrial suburbs, which led to its devastation during the war.

*The Bodden Coast.*¹ Partly in Mecklenberg and partly in Western Pomerania (Vor Pommern), this coast also has a number of old ports which have seen more active days, such as Rostock (122,000 in 1939) and Stralsund. From Warnemünde, the outport of Rostock, a train-ferry service operates to Copenhagen, enabling the journey from Berlin to the Danish capital to be accomplished in ten hours. Stettin (269,000 in 1939), on the Oder, however, was a larger port than either Rostock or Lübeck, mainly because, like Hamburg, it is fed by a series of great inland waterways. It was connected with Berlin by canal and may be looked upon as the Baltic port of that city. It had an important shipbuilding industry, iron and steel works (including blast-furnaces), timber, paper, and food industries. It now appears to have been incorporated *de facto* in Poland, although it became a German city in 1243 and a member of the Hanse in 1360, and has experienced 700 years of German settlement and development.

The Immediate Hinterland of the Baltic Coast and the Baltic Heights. A strip of fertile lowlands covered with boulder clay margins the Baltic coast and extends inland for some ten to twenty miles, attaining a maximum width of about fifty miles on the borders of Mecklenburg and West Pomerania. With strong resemblances to East Anglia it has similar farming; most of the land is under the plough, with sugar-beet on the best soils, though rye is more important than wheat, and potatoes cover a large area; green fodder crops are extensively cultivated, and livestock (cattle, pigs, horses, and some sheep) are important. The region was one of the chief food suppliers to the Ruhr industrial area.

¹ In the Russian zone as far east as the mouth of the Oder.

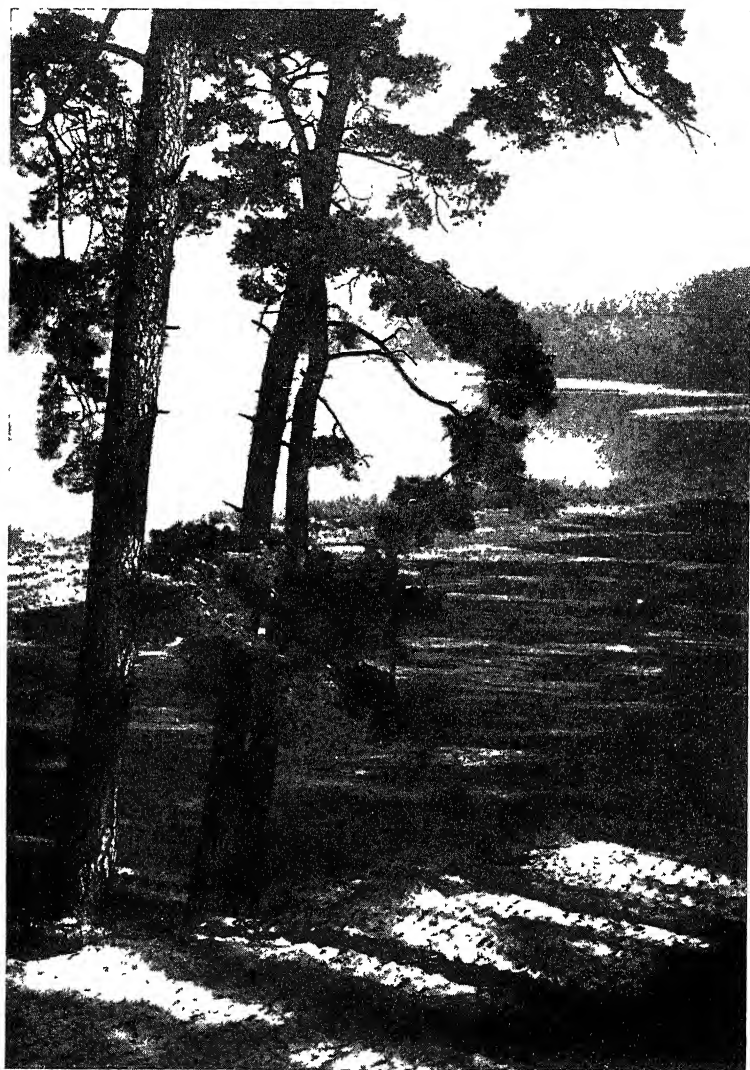
The boulder clay lowlands rise southwards to the Baltic Heights, sometimes, and perhaps more accurately, termed the Baltic Lake Plateau. To north and south this hummocky plateau is bounded by terminal moraines of coarse material. The innumerable lakes are of all shapes, the largest being L. Muritz. The soils vary from boulder clay to sands and gravels, but at least 70 per cent. is under cultivation, though many woods of pine and beech still remain. On the southern margin the plateau falls to a sandy outwash plain which merges into the zone of *urstromtäler*.

The population density is rather low in the whole of this area, and the towns are few and small, apart from the ports already mentioned. The Baltic Lake Plateau was a traditional stronghold of large estates, which justified themselves by evolving and maintaining very high standards of scientific farming. Holstein, on the other hand, was a province of small holdings.

*The Zone of Great Valleys.*¹ This low-lying region presents a series of broad, swampy valleys (*urstromtäler*), running from east to west, and alternating with slightly higher ground composed of dry, generally sandy soils. The present river system has developed valleys at right angles to the old *urstromtäler*, though in some cases the old Ice Age valleys are still utilised by streams, as, for instance, by the lower Havel and Spree. The soil is prevailingly sandy and gravelly, though occasional patches of ground-moraine are found between the *urstromtäler*, and in the valleys there is a considerable amount of alluvium, since the post-glacial sinking of the Baltic coast raised the base-level of erosion and so reduced the gradient of the rivers and increased their liability to flooding. The alluvium itself, however, is often sandy, since it is derived to a large extent from the zone of recent glaciation. The whole region was originally forested and was colonised by the Germans at a relatively late date, mainly from the twelfth century onwards, principally through their efforts at draining the swampy valleys. The *urstromtäler* with their alternation of peat swamp and heath-covered or wooded sand-dunes must have presented a discouraging picture, but once drained they offered more fertile soil than the sandy stretches between, in whose forests lay the scattered clearings of the original Slavonic-speaking peoples. The names *Altmark*, *Mittelmark*, and *Neumark* indicate the stages of advance of the "march" or border-county of Brandenburg, since the old *mark* (*cf.* the English phrase "the Welsh Marches") lay west of the Elbe, the middle *mark* between the Elbe and Oder, and the new *mark* east of the Oder. Although cumbered by old sand-dunes and by later post-glacial alluvial cones which

¹ Now mainly in the Russian zone or under Polish control, except for Berlin, which is divided into four zones.

were deposited by the new north-south or south-north flowing rivers, the *urstromtäler* yet lent themselves to utilisation for canals,



Courtesy German Railways Bureau, London

FIG 81.—ON THE BANKS OF THE RIVER HAVEL.

Note the pine trees and the loose sand visible in the foreground.

which have the great advantage of being almost entirely free from locks, such is the lack of gradient from east to west. Not only were these canals important before the railway era, but they were still able up to 1945 to compete with the railways for heavy bulk goods such as coal, timber, building stone, cement, and so on, which were needed to supply the city of Berlin.

Apart from Berlin there are no large cities in this region, nor is there any considerable industrial development. Berlin (4,332,000 in 1939; 3,336,000 in 1950) is the great exception. When the capital of the county of Brandenburg was moved from Brandenburg town eastwards to Berlin at the end of the fifteenth century, only a small settlement existed at this crossing-place over the Spree, where the river could be fairly easily bridged owing to the presence of an island. From that time onwards the town grew with the power of the Electors of Brandenburg, who became also Kings of Prussia in 1701 and Emperors of Germany in 1871. It had only about 100,000 people at the end of the eighteenth century, whereas London had 865,000 in 1801 and Paris 548,000. As in the case of London and Paris, the railway system was made to focus upon the capital city, and the excellence of its communications by rail and water have helped to foster the growth of a great variety of manufacturing industries, and it was, in fact, like London and Paris, the most important isolated manufacturing centre of its country. Among the multitudinous variety of manufactures, electrical apparatus took first place, while there was also a great development of the clothing, building, printing, and publishing industries, and miscellaneous light engineering. During the present century Berlin also had become the foremost educational and artistic centre of Germany. Its future is problematic.

Brandenburg (64,000) and Frankfurt-am-Oder (76,000) both lie in the same *urstromtal* as Berlin. The latter, an old Hanse town, was built at a crossing-place over the Oder, its commercial fairs being of considerable importance. It now stands on the Germano-Polish frontier.

The zone of great valleys virtually terminates on the south with the infertile, upland zones of the Fläming and the much dissected Lusatian Hills (Nieder Lausitz), though there are some traces of *urstromtäler* to the south. These ridges continue the line of the Lüneburg Heath. The last ice-sheet was halted here, probably by the increased elevation, for beneath a relatively thin cover of glacial material are Tertiary sands and clays, together with beds of lignite. The Fläming partakes of the character of the Lüneburger Heide, with heath and forest covering its dry, unproductive sands,

and so to a less extent do the Lusatian heights, which in any case do not exceed 723 feet and would hardly be distinguished as "heights" if the surrounding country were not so flat. The Lusatian lignite supplies briquettes and electricity to Berlin, and fuel for the local glass industry, while the woollen industry of Kottbus and other towns of Nieder Lausitz, which arose out of a desire to supplement farm-incomes in an unproductive area, was one of the main suppliers of the Berlin clothing industry up to 1945.

(C) **The Southern Transitional Borderlands.** Festooned along the southern edge of the glaciated plain of northern Germany is a strip of fertile lowland which closely follows the wavy northern edge of the *Mittelgebirge* or Central Uplands. Here are no great thicknesses of morainic material; instead, the solid rock is usually near the surface, though often concealed by a mantle of löss, or by similar loams, which perhaps represent löss reworked by water action. This transitional strip becomes very attenuated and practically disappears near Osnabrück where the Weser Hills project like a great bastion into the plain; it broadens out in great embayments in three main areas, particularly round Leipzig, in Upper Silesia, and on a smaller scale round Cologne. The Münster Bay, in the region of the upper Ems drainage area, has certain similarities, but no löss, except for a very narrow strip near Soest, which gives its name to the Soeste Börde (dialectal German="border").

The soils of this zone are mainly degraded chernozems and brown forest soils of great fertility, and their significance lies in their occurrence between the ungrateful morainic deposits farther north and the thin soils of the rugged mountain country to the south. The löss belt is one of those "regions of increment" which amply reward human effort, and it has been assiduously cultivated from the beginnings of agriculture in Neolithic times. It is still perhaps the best farming land of Germany, especially for cereals. Even where patches of soil fall below the general level of fertility, heavy manuring and skilful rotation of crops have rendered them as productive as the rest. The land carries a high density of rural population (between 400 and 500 per square mile), and is so costly that none can be wasted, and the variegated cultivation-strips succeed one another without hedges or fences. Wheat, sugar-beet, barley, and stall-fed cattle are the chief preoccupations of its rich agriculture.

Numerous ancient towns lie in this belt, such as Aachen, Cologne, Essen, Dortmund, Soest, Paderborn, Hanover, Brunswick, Halberstadt, Magdeburg, Halle, Leipzig, Chemnitz, and Dresden. Most of these are situated at nodal points, where valleys from the mountain zone debouch on the plain, for the löss strip seems to have been

cleared of its light woodlands in prehistoric times, and thus offered an east-west line of movement. The cities became great during the Middle Ages through commercial activities and manufacturing crafts; in many cases they were also administrative centres of secular and ecclesiastical authority, the three main functions obviously being closely bound up with each other.

To this wealth of agricultural and commercial prosperity was added in the nineteenth and twentieth centuries the exploitation of vast deposits of coal and lignite, and the large-scale development of factory industries. Small wonder, therefore, that this belt at the foot of the Central Uplands is one of the most densely populated zones of Germany, and, indeed, of Europe. It forms part of the great axial belt of dense population which runs from the Straits of Dover eastwards and south-eastwards to the Ukraine.

These transitional borderlands may conveniently be treated in three main divisions: (i) to the west of the Weser Hills are the lower German Rhinelands including the Westphalian (Ruhr) industrial area, and, for convenience, the Münster bay of lowland; (ii) in the middle is the Saxon bay of lowland, centred on Leipzig, with extensions to Hanover on the north-west and Dresden on the south-east; (iii) in the east is the Silesian Bay, long a bone of contention between German- and Polish-speaking people, and in Polish hands since 1945, the *de facto* frontier having been pushed westwards to the Central Uplands.

The names Ruhr and Silesia at once suggest great coalfields, and, in fact, practically the whole of the coal output of Germany came from this belt, though in addition to the bituminous coal of the above-mentioned fields, there are vast deposits of lignite in two main areas: a western mining area between Cologne and Bonn, and a central mining area round Leipzig. A third lignite area is situated farther east in the Lusatian (Nieder-Lausitz) Hills, which lie between the *urstromtäler* and the löss belt. The annual German production of bituminous coal from this transitional belt amounted to about 165 million tons, together with no less than 193 million tons of lignite. The industrial character of the belt is perhaps its main feature in modern times. It should be noted, however, that industry grew up amidst a cultural landscape of smiling agriculture and ancient settlements, unlike the main industrial belt of England. A good deal of formerly fertile land has been sacrificed to open-face mining of lignite and to industry.

The transitional belt is closely linked with the Central Uplands on the south, as many of its industries were originally sited in the Uplands, but moved downhill to the coalfields in the nineteenth century.

(i) *The Lower German Rhinlands*.¹ The rich agriculture of the north Rhenish plain and of the Münster area tends to be overshadowed by the industrial developments connected with the great Westphalian (Ruhr) coalfield, the small Aachen coalfield, and the important Cologne-Bonn deposits of lignite.

In spite of much twentieth century industrial expansion in other parts of Germany, the Ruhr coalfield is still the mainstay of German industry, particularly of heavy industry, such as coke production, pig-iron and steel manufacture, heavy engineering, and heavy chemicals. Nor could these be moved, as they depend primarily on the presence of coking coal, and secondly on the position which gives ease of transport both by rail and by the great artery of the Rhine and its feeder canals.

The Ruhr coalfield lies east of the Rhine on the northern border of the Rhine Highlands. (*See* pp. 281-284.) It had a greater output than any other in Europe and probably greater reserves even than the Silesian and Donetz coalfields, its only rivals on the Continent. Its exploitation is more recent than that of the great coalfields of the British Isles, which stand next to it in output, since it produced only about 2½ million tons in 1850 and less than 12 million tons in 1870, whereas the Yorks, Derby, and Notts coalfield was producing 10·8 million tons even by 1855. It had therefore the advantage of being able to profit by the experiments of others in regard to technique, not only in the actual mining, but in the development of industries dependent upon coal.

For some years before 1914 the annual production averaged about 100 million tons, or about 60 per cent. of the total German output. In 1937 the output was 128 million tons out of a total of 185 million tons, *i.e.* 70 per cent. With the loss of the Silesian mines and the diversion of the Saar coal to France, the Ruhr becomes Germany's sole bituminous field of importance, the Aachen coalfields producing only about 7 million tons and the Zwickau fields of Saxony only about 4 million tons per annum.

Like the mines of Great Britain, and in contrast to those of France and Belgium, the coal-measures are little disturbed except by occasional faults and gentle warping, and are fairly easy to work. The coal-measures were apparently slightly tilted by the Tertiary uplift of the Rhine plateau, and the upper measures, as well as the covering mantle of later material, were denuded from the southern part of the field, so that here the coal actually outcrops in the valleys. It was therefore easily worked in the early days by means of adits and shallow mines, but this coal is not of such good quality as that obtained north of the Ruhr River. The coal-measures gradually sink northward under a mantle of Secondary, Tertiary, and recent

¹ In the British zone.

material, and the northern limits of the coalfield have not yet been ascertained, though mines are worked at a depth of more than 4,900 feet near Münster. As the coal-measures sink northward, the depth of the overlying rocks becomes greater, but at the same time the coal-measures themselves increase in thickness, and coals of ever richer quality are added to the stratigraphical sequence, having escaped the denudation which removed them farther south, so that on top of the poor coals of the Sauerland border come coking coals along the Ruhr valley, on top of these farther north come gas coals, and lastly north of the Emscher come long-flame coals (*see* Fig. 82).

The working of this coalfield has given rise to a great industrial belt some 45 miles long from east to west by 15 miles wide from north to south, which is ever extending northwards and devouring more of the agricultural countryside as newer and deeper mines are opened. The main industrial area, which lies north of the River Ruhr and stretches from Duisburg (355,000) to Dortmund (434,000), contains about five million people and forms in reality a single conurbation, there being practically no break in the continuity of houses and factories, though the names of Essen (521,000), Gelsenkirchen (271,000), and Bochum (245,000) may be mentioned among the more important urban centres. South of the industrial belt, however, even along the River Ruhr itself, the thinly populated, hilly and wooded country of

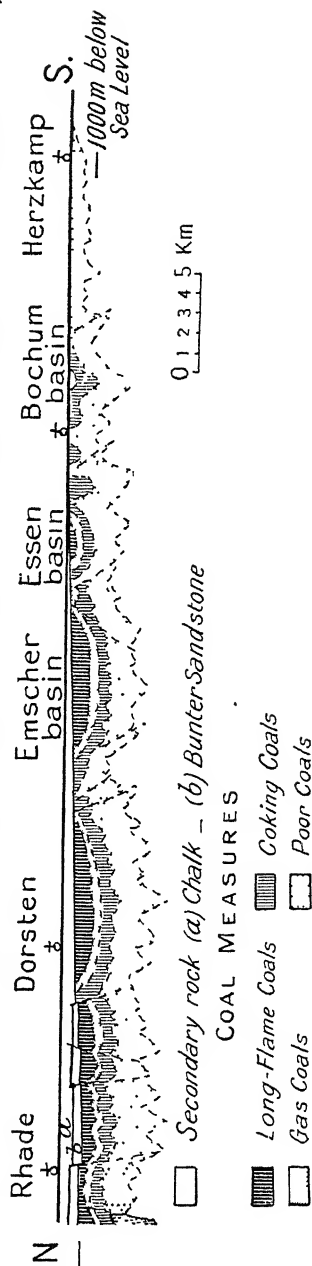


Fig. 82.—SECTION ACROSS THE WESTPHALIAN COALFIELD.

the Sauerland forms a natural "playground" for the workers, while on the north of the industrial belt, north of the Emscher, the coal-mines and mining settlements are scattered among farms, woods, and heathland.

Apart from the actual mining, the chief forms of industry are the manufacture of heavy iron and steel goods of all kinds, and the essential preliminary manufacture of coke and pig-iron. The iron-ore now has to be imported, as Germany's own resources in this raw material are small, the insufficient and expensive Siegerland ores being her chief home supplies. Even before the loss of the Lorraine ores, millions of tons of iron had to be imported, and in 1934 some 5 million tons (60 per cent.) were supplied by Sweden, 1.6 million by Lorraine (20 per cent.), and smaller amounts by Spain, North Africa (Algeria and Tunisia), and Austria. Needless to say, the position on the plain renders the transport of this heavy raw material a relatively easy matter, and river, canal, and rail supplement each other in the supply and distribution of raw materials and manufactured goods. Heavy goods travelling in bulk, such as imported iron-ore and imported grain, move principally by water, with the exception of the Lorraine ores, which must go by train, as the meanders of the Moselle make navigation prohibitively tedious. The large amounts of coal and coke sent away from the Ruhr also utilised the waterways, particularly the canalised Ruhr and Emscher, which penetrate the heart of the coalfield, and the Rhine itself, both downstream towards Holland and upstream to the middle Rhine valley and the adjacent lands. The twin port of Duisburg-Ruhrort on the Rhine formed not only the most important river port of Germany, but also of Europe, with a tonnage exceeding that of Hamburg. It was concerned with the transshipment of coal outwards, and iron-ore, grain, and petroleum inwards, either on to the Rhine-Herne canal and River Ruhr or on to the railway and *vice versa*.

South and west of the Ruhr coalfield are a number of other manufacturing districts which form part of the industrial complex of the Lower Rhinelands; they draw their supplies of fuel mainly from the Ruhr coalfield, and of electric power from a grid system fed by the Ruhr coalfield and the Cologne-Bonn lignite. They might be looked upon as satellites of the Ruhr industrial area, except that many of them were established long before the coalfield was opened up. The chief of these districts are, first, the Sauerland, with the Wuppertal textile towns and the cutlery towns of Remscheid and Solingen. Secondly, the textile towns of the Krefeld, München-Gladbach area; thirdly, the Cologne-Düsseldorf district; and fourthly, the Aachen district.

The Wuppertal towns of Elberfeld and Barmen, which now make one conurbation of 325,000 people hemmed in along the narrow incised valley of the Wupper in the Sauerland plateau, were noted for their textiles long before the exploitation of the coalfield began, for the clear soft waters of this Sauerland stream provided both power and the necessary water for washing and dyeing. Cotton, silk, rayon, haberdashery, and carpets are among the chief manufactures, together with machinery and chemicals needed for the various manufacturing processes involved.

Solingen (132,000) and Remscheid, farther south, on the Sauerland plateau, form jointly the Sheffield of Germany and have long been noted for their cutlery and fine steels, but in recent years have added all kinds of hardware and "Birmingham" ware. Formerly they exploited small local iron-ores which were smelted by charcoal, but they now derive their pig-iron or bar-steel from the Ruhr area.

Crefeld (Ger., Krefeld; 149,000) is a fairly old textile centre chiefly noted for its silk, but now, like its neighbours, München-Gladbach (110,000) and Rheydt, it also manufactures cotton and rayon.

Standing somewhat aloof from the industrial area dependent on the Ruhr coalfield is the woollen manufacturing centre of Aachen (Aix-la-Chapelle, 110,000), on a little coalfield of its own, which is situated, like the Ruhr coalfield, at the foot of the Middle Rhine plateau. One of the oldest towns north of the Alps, its mineral springs were known to the Romans, and the city was the capital of the Carolingian Empire.

For all this region the commercial capital was the old Roman foundation of Cologne (Ger., Köln), although its virtual destruction during the war has caused at least a temporary eclipse. Population decreased from 768,000 in 1939 to 488,000 in 1946. Its nodal position, where the Rhine river route crossed an east-west land route skirting the Rhine plateau, was obviously an important factor in its rise and development, but although it flourished in Roman times and still more in mediæval times, with the overland trade in eastern and Mediterranean commodities, its modern growth dates from the development of the Ruhr coalfield, for in 1871 it was still a comparatively small city of 80,000 people. A good deal of the capital for the early mines and industries of the Ruhr district was supplied by Cologne, which thereby added to the field of its commerce. Of recent years the fuel wealth of the northern Rhinelands has been increased by the large-scale working of Tertiary lignite at the very doors of Cologne itself, in the Ville mining area which extends as far as Bonn. The lignite is practically on the surface and therefore easy to work, and it forms a cheap source of electrical

power, thereby freeing the Ruhr coal for other purposes. About one-third of Germany's lignite was produced in this area.

The industrial area of Cologne spread in pre-war years to the right bank of the Rhine (Mülheim, Deutz), where engineering industries are mainly located. Farther downstream, the modern town of Leverkusen, noted for the great I.G. Farben chemical plant, belongs to the Cologne industrial complex, in which Düsseldorf (420,000) may also be included. Düsseldorf, with heavy and light engineering, is the commercial headquarters for many of the Ruhr industrial firms, and since 1945 has surpassed Cologne as an industrial and administrative centre.

The Lowland of Münster. The lowland bay of Münster may be looked upon as an Hercynian basin covered in parts by glacial deposits, and it is therefore transitional between the Hercynian region of middle Germany and the northern plain. On its eastern and southern borders the chalk outcrops, in the middle of the basin are Tertiary deposits, mainly marls, while on the northern edge are glacial sands. The region was almost wholly agricultural until the discovery of the underlying coal-measures, but industry is gradually creeping into it along the Dortmund-Ems canal, and also owing to the sinking of mine shafts in the south. The ancient town of Münster, which is the regional capital, is an important railway junction, with some agricultural industries.

(ii) *The Leipzig Lowland and Adjacent Areas.* The core of this area is the lowland bay which pushes southward into the Hercynian Uplands between the Harz and the Thuringian Forest on the west and the Erzgebirge (Ore Mountains) on the south-east. Löss deposits are especially extensive round Leipzig and Halle, while Magdeburg on the Elbe may be looked upon as the extreme northern limit. A great new industrial complex developed in this lowland in modern times, particularly during the present century. A narrow extension of the löss lowland continues to the north-west as far as Hanover, in a Börde zone at the foot of the Harz and Weser Hills. On the south-east, the old industrial complex of the Zwickau-Chemnitz-Dresden area (the Saxon Uplands, *q.v.*, p. 291), has some features in common with the Leipzig area, though it is a dissected plateau rather than a plain. The Leipzig bay, but not its north-west extension, lies within the Russian Occupation Zone.

The Leipzig bay of lowland, while still important agriculturally and containing many ancient cities with old-established industries, has been chiefly significant in modern times for its heavy chemical industries, based on the exploitation of vast deposits of lignite and salt. Lignite was first used here, on a considerable scale, about the middle of the nineteenth century, to provide fuel for the sugar-beet factories.

A little later it began to be used in converting potassium ("Stassfurt") salts into agricultural fertilisers. Lignite suffers from two main disadvantages; it has little more than half the calorific value of bituminous coal and it disintegrates very easily in transport. Hence its value was purely local until the process of briquetting improved its carrying qualities; it became of supreme value only when inventions in electrical engineering enabled electric current derived from lignite to be transported economically over long distances. The lignite of the Leipzig bay provided a cheap source of fuel, because in many areas, particularly south and west of Leipzig, they occur so close to the surface that open-cast mining can be practised. Lignite supplied power to great electric centrals, *e.g.* the great Zchornewitz plant built in 1917, which supply the whole region of of the Leipzig bay, as well as serving the Zwickau-Chemnitz-Dresden area and sending current as far afield as Berlin. Lignite played a dual rôle in the great chemical industries of the Leipzig lowland. It not only supplied fuel and power, but was a major raw material.

The distillation of lignite gives rise to a whole range of modern synthetic products. Nitrogen compounds, for use in nitrogenous fertilisers and explosives, were among the most important, the great Leunawerke near Merseburg being the chief production centre. Coal-tar products, such as synthetic oils, plastics, dyestuffs, explosives, as well as many humbler materials, were manufactured in this area. Synthetic rubber ("Buna") was produced in quantity at Schkopau near Leipzig.

Among the major branches of the heavy chemical industry of this region was the working up of potassium and common salt. The potassium deposits of Germany are mined on the borders of the Harz horst, especially near Stassfurt and Halle. They are found in the New Red Sandstone (Upper Permian), overlying thick deposits of common salt, and were apparently formed by evaporation in marine lagoons. Besides being converted into agricultural fertilisers, potassium salts were used in the manufacture of soap, glass, explosives, etc. The chief manufacturing centre was Bitterfeld, north of Leipzig. Common salt, long exploited near Halle, as the name implies,¹ forms the basic material for the preparation of caustic soda which is widely used in the manufacture of soap, glass, artificial silk, and many other commodities. Bitterfeld was again the main centre.

The industrialisation of the Leipzig area received a great stimulus during the war of 1914-18, the Leunawerke being built during this period. After 1918, the loss of the Saar coal and of the greater part of the Silesian coalfield intensified production here, especially

¹ The root "hall" in the names of many German towns, *e.g.* Hallein, Hallstadt, indicates the presence of salt. The "Halloren" formed a kind of guild of salt-workers during the Middle Ages.

as the region possessed the strategic advantage of remoteness from Germany's frontiers, unlike the Ruhr and Silesian industrial areas. The large-scale and ingenious exploitation of lignite may be said to amount to a minor industrial revolution, while the amount produced was greater than in any other area of the world.

In addition to the heavy chemical industries already mentioned, agricultural industries are scattered throughout the countryside, while the making of machinery and the working up of metals, *e.g.* aluminium from imported bauxite, were important.

Three large historic cities lie in this area. Magdeburg (334,000 in 1939), though not the largest, had become the chief commercial centre, dealing especially in lignite, potash, and sugar-beet. It also had considerable manufactures, including foodstuffs (sugar, chocolate), machinery, and chemicals. It benefited during the nineteenth century from improvements in navigation on the Elbe. The presence of two large towns so near together as Leipzig (702,000 in 1939) and Halle (220,000 in 1939) was the result of the political subdivision of Germany before 1871, a frontier line formerly running between them. The more central position of Leipzig favoured its growth, and so also did its famous twice-yearly industrial fairs, which date from the thirteenth century. Leipzig was noted as the leading German printing and publishing centre, and, in addition, made machinery, textiles, pianos, etc. Halle's mediæval importance lay in its salt mines, but in the nineteenth century it became an industrial town with varied manufactures, including machinery for the sugar-growing and sugar-manufacturing industries, printing and paper, brewing, and chemicals. It had an important grain market.

The north-western extension¹ of this area is less industrialised, but manufactures have grown up during the last 80-90 years on the basis of good communications, surplus agricultural production, and mineral wealth (salt, lignite, iron-ore, petroleum). Agricultural industries are scattered throughout the countryside and also concentrated in the old market and administrative centres of Hanover (Ger., Hannover; 355,000) and Brunswick (Ger., Braunschweig; 181,000). Both these towns manufacture rolling-stock, road vehicles, and machinery of various kinds. Hanover is also the chief German manufacturer of rubber tyres. In addition, it refines mineral oil from the nearby Nienhagen oil-field, which produced 350,000 tons out of the Reich total of 550,000 tons in 1938. The oil is here associated with Upper Permian salt domes.

Exploitation of the low-grade iron-ore of the Peine-Salzgitter area between Hanover and Brunswick began in 1937 to supply the large new iron and steel works at Salzgitter, but the plant has been dismantled by the Russians after the end of the war.

¹ In the British Zone.

CHAPTER XX

GERMANY (*contd.*)—SOUTHERN SECTION

A. THE HERCYNIAN LANDS

IN contrast to the monotonous and often dreary plains of northern Germany, one enters in southern Germany into a region of great diversity. Here smiling plains are backed by wooded hills and mountains; agriculture is more varied, and orchards, vineyards, hops, and tobacco enter into the scene; holdings are small and population dense; old, comfortable-looking farmhouses are met with at every turn; and though manufactures are added to agriculture, as a rule there is no disfigurement of the landscape. In short, this is the old Germany of legend and song, of Holbein and Dürer, Beethoven and Goethe. With its picturesque old towns and villages and the well-cared-for appearance of its countryside, it is perhaps more reminiscent of south-eastern England than of any other part of Europe, though to English eyes everything appears exaggerated: the hills are higher and more wooded, the scarps steeper, the plains more fertile, the summers hotter, the winters more snowy, and finally the buildings are more fantastic in style, the Gothic more betimbered and begabled and the Renaissance style definitely Baroque.

This region of Hercynian horsts with the included scarplands and plains is often called by German geographers *Die Mittelgebirge*, which may be rendered into English as the Central Uplands.

The Rhinelands. (i) *The Rift Valley and Bordering Mountains.* Below Basle (German-Swiss, Basel) the Rhine enters a great rift valley, 180 miles long and about 20 miles wide, which is flanked on either side by mountains. Though the French frontier now reaches to the Rhine in Alsace, yet the structure on either side of the river is so similar and the region such an obvious physical unit that it will be treated here as a whole.

The bordering mountains, Vosges and Hardt on the west, Schwarzwald ("Black Forest") and Odenwald on the east, represent the flanks of an Hercynian massif of which the middle section has dropped, like the keystone of an arch, to form the plain of the rift valley. The massif, which represented the stumps of part of the Hercynian system, was raised up in mid-Tertiary times, together

with the hitherto undisturbed sedimentary rocks of Mesozoic age which had been deposited on top. The collapse of the middle portion between lines of faults running from north to south took place in late Tertiary times. Evidently the southern part of the massif had been raised to a greater height than the northern portion;

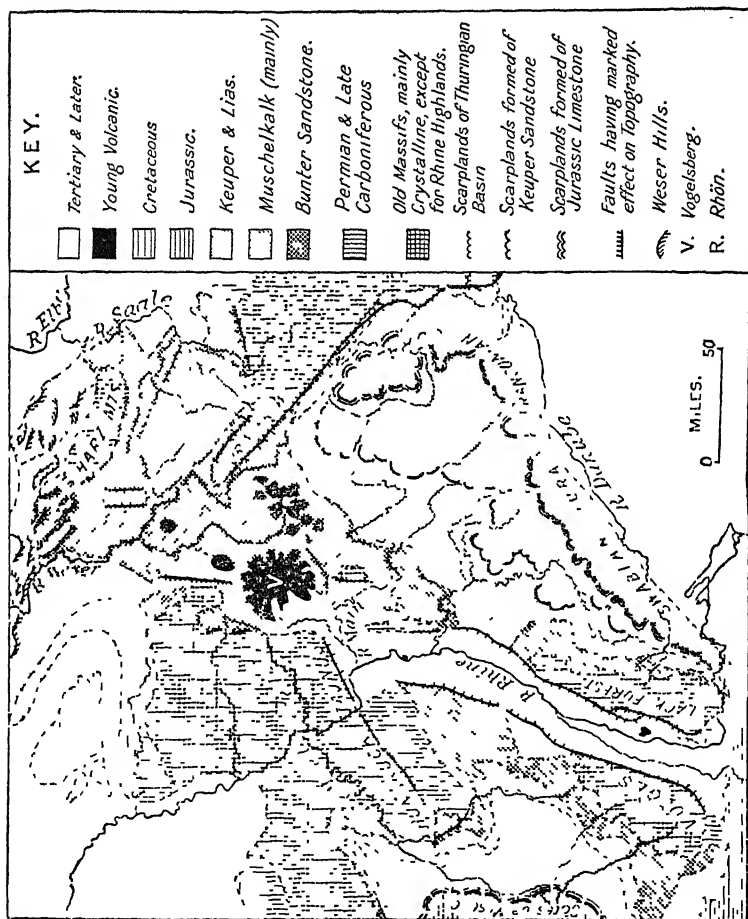
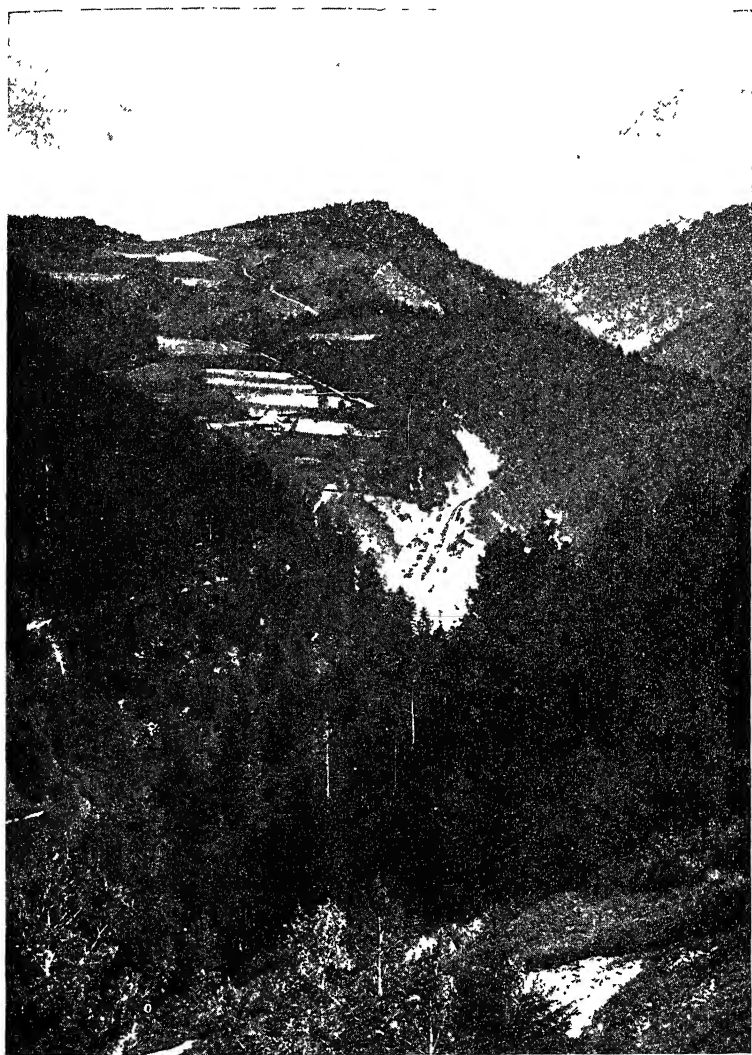


FIG. 83.—MORPHOLOGICAL DIAGRAM OF THE LANDS OF THE MIDDLE RHINE, HESSE, AND THURINGIA

consequently erosion was greater in the south, and the Mesozoic sedimentaries were removed from the regions of greatest elevation, particularly in the southern Vosges and southern Schwarzwald, where granites and gneiss were exposed. The greatest heights, however, are still to be found there, the Ballon d'Alsace in the Vosges reaching 4,672 feet and the Feldberg in the Schwarzwald

4,900 feet. Farther north, and on the outer flanks of these mountains, Lower Triassic sandstone, known as Bunter sandstone (Ger.,



[Courtesy German Railways Bureau, London]

FIG. 84.—VIEW IN THE BLACK FOREST.

Note the steep rejuvenated valley (the Höllental) in contrast to the smoother slopes of the heights.

bunt=variegated), is found. The same type of rock is called *grès vosgien* in France.

Both the Schwarzwald and Vosges are in places deeply dissected by rejuvenated valleys, without, however, losing the generally rounded forms of the old Tertiary peneplain which existed before the massif was raised. Originally densely forested, much of the land has been cleared, mainly for pasture, though the timber industry

remains important. In the Schwarzwald the carving of wooden articles is a considerable home industry in winter, while in the valleys of the Vosges an important cotton industry has grown up.

North of the Schwarzwald is the depression of the Kraichgau, or Neckar-Bergland, which though higher than the rift valley, contrasts with the forested mountains to north and south, since the *muschelkalk* which overlies the Bunter sandstone is here preserved and gives a good agricultural soil. Like the similar low-lying Saverne *col* north of the Vosges, this break in the mountains is utilised by an express railway line (Paris-Constantinople).

The Odenwald and the Hardt face each other across the northern part of the rift valley. The Odenwald repeats the features of the Black Forest on a smaller scale, with old crystalline rocks on the west and

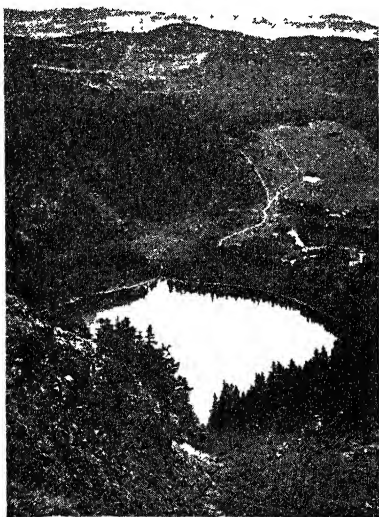


FIG. 85.—THE BLACK FOREST FROM THE FELDBERG.

This high plateau, with its rounded forms, is typical of the many peneplanated massifs of west and central Europe. The Feldberg (4,900 feet) has a bare, flattish summit, but the Feldsee at its eastern foot, occupies an old *cirque* or *kar*.

Bunter sandstone on the east, but in the Hardt mountains the old crystalline core is completely covered by the Bunter sandstone, while farther north and west in the Palatinate (Ger., Pfalz) appear Permian and Carboniferous strata, including the coal-measures of the Saar (Sarre) district. These have been preserved in a geosyncline which follows the direction of the strike, which is here from south-west to north-east.

The Saar region, administered by the League of Nations from

1919 to 1935, returned to Germany in the latter year as the result of a plebiscite. The important coal mines, producing about 13 million tons of coal per annum in the 1930's, were opened up in the midst of a partly forested, partly agricultural countryside and have been greatly developed since 1880, when the value of the Lorraine iron-ores became apparent. The marked tectonic depression of Landstuhl facilitates access between the Saar region and the Rhine Valley, by leading part of the way through the Bunter sandstone region *via* Kaiserslautern.

The Rhine rift valley itself was let down between a series of step faults, by means of which strata of the Mesozoic epoch have been preserved in the fertile foot-hill zone. It is by no means a simple flood plain, but has a somewhat long and complicated geological history behind it, which accounts for the variety of deposits to be found at the surface. During early Tertiary times the rift valley, which opened to the south and had no outlet to the north, was covered by an arm of the sea. This sea gradually became a brackish lake and finally was drained by a river flowing towards the south-west through the present gap of Belfort. In the Pliocene period further earth movement followed, which reversed the drainage, and sent the Rhine northward across the Rhine plateau, which was then presumably at a relatively lower level than at present. The lowering of the base-level of erosion, *i.e.* the increase in the gradient, following on this change, caused much of the Mesozoic sediments to be eroded, but dissected Mesozoic and Tertiary material is to be found in the hills of Hesse in the north-west and in smaller patches elsewhere on the borders of the plain. The Ice Age caused much of the valley to be covered with infertile gravel and sand brought by torrents from the mountainous borders (as, for instance, between the Ill and the Rhine in Alsace), though the accumulation of löss on and near the foot-hills perhaps more than compensated. The word "löss" itself is apparently of Alsatian origin. Finally, alluvium was spread over the middle and lower part of the valley as the rivers ceased to have erosive power and swung in wide meanders from side to side of the flood-plain. The alluvium is especially thick in the Rheingau, or lower part of the Main valley, where sinking appears to be still in progress.

The rift valley presents, therefore, a surface where dry gravels alternate with swampy alluvium, between a border of löss and other fertile deposits. Even volcanic rock (Tertiary) is represented in places, as in the Kaiserstuhl. The gravels generally remain useless and have only a thin covering of poor forest, but the swampy regions have been drained, and these together with the löss and foot-hill zone provide some of the richest agricultural land of Europe. The

relatively low latitude (about $47\frac{1}{2}^{\circ}$ to 50° N.) and altitude (mostly below 600 feet) combine to give the rift-valley lands of Baden, Hesse and Pfalz the best climate to be found in the whole of Germany, mainly because the spring comes earlier and the summers are longer than elsewhere. Nor, in spite of its cold winters, is Alsace surpassed in agricultural richness, even by the greater plains

of France. The typical cultures are wheat, hops, and tobacco, Baden, for instance, being the principal tobacco-manufacturing state of Germany. Sugar-beet is also of considerable importance, and along the foot-hills orchards flourish, especially on the eastern side along the so-called Bergstrasse, while vineyards are numerous, especially on the western side in Alsace, Pfalz, and Hesse, where the slopes have a southerly as well as an easterly aspect.

Although the Rhine has been regulated and a straight channel cut through its meanders, yet its former uncertain banks prevented any important settlements from growing up on the river south of Speyer, and even at the present day a deserted swampy zone separates Baden from Alsace. The larger settlements in the southern part of the plain are mainly near the junction with the foot-hills, e.g. Freiburg (100,000), Karlsruhe (172,000), Heidelberg (112,000).

Even Strasbourg, the apparent exception, was built away from the Rhine, actually on the River Ill, and has only reached the main river in modern times. Nowadays it stands at the virtual head of navigation on the Rhine, a position formerly held by Mannheim (213,000), which at the junction of the Rhine with the Neckar is still one of the busiest river ports and manufacturing towns of the Rhine rift. The northern part of the Rhine rift has a surprisingly large number of big towns, probably

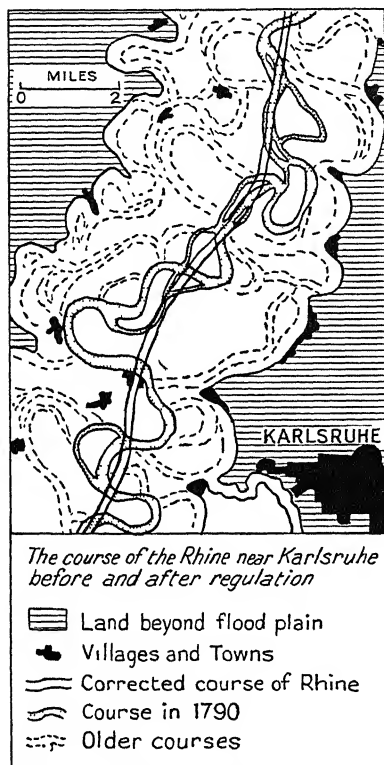


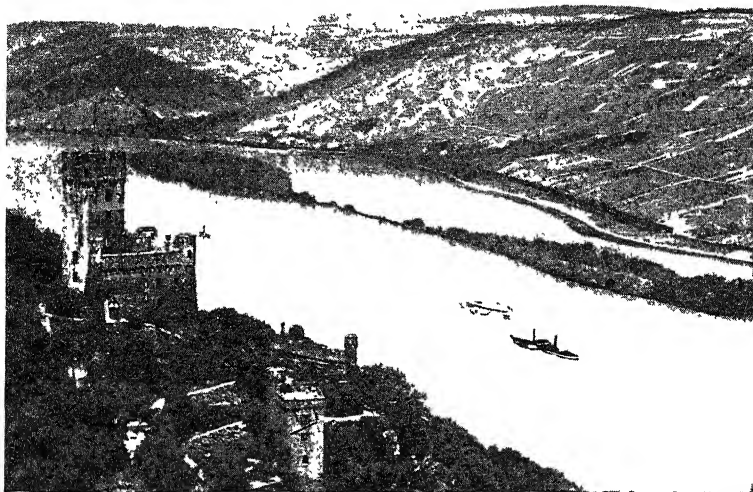
FIG. 86.—THE COURSE OF THE RHINE NEAR KARLSRUHE, BEFORE AND AFTER REGULATION.

too many under present conditions. Their growth was no doubt favoured by the excellent nodal position of this region, as well as by the richness of the soil, but they grew up under different political conditions from those of the present day, at a time when Germany was much divided into different sovereign states, each of which had its own independent capital. At present some of these towns, such as Worms, seem to be stagnating, but others have been revived by the introduction of modern manufactures, particularly metallurgical, electro-technical, and light engineering with motor cars and bicycles figuring prominently. Cheapness of transport on the Rhine has played its part, as in the development of the great heavy chemical works at Ludwigshafen opposite Mannheim, but the excellent rail and road networks are more important for most of the industries, which resemble those of the Coventry district of England. Frankfurt-on-Main (Ger., Frankfurt-am-Main; 422,000), though remaining very important as a banking town, is the centre of a great industrial conurbation of over a million people. It is the capital of "Bizonia," the combined U.K.-U.S.A. zones. Between Frankfurt and Mainz lies Russelheim with the great "Opel" works, while there are many other small industrial towns. The old Roman foundation of Mainz is a busy river port and has varied manufactures. In this area only the inland spa of Wiesbaden (182,000) seems to have held aloof; the very nature of its chief source of livelihood precluding its industrialisation. Farther afield, even Heidelberg, the oldest university town of Germany, has added a manufacturing quarter on the Rhine plain to the west of the old town, while Karlsruhe, the princely seat of the former rulers of Baden, makes machinery.

North of the Odenwald the line of the eastern bordering highlands breaks down and a continuation of the rift valley takes its place, though the direction of the valley changes and runs here from south-west to north-east. This depression, known as the Frankfurt basin, is occupied by the lower course of the River Main, and it was no doubt once prolonged even farther north until the Tertiary volcano of the Vogelsberg blocked up almost the whole width of the depression, leaving only a narrow strip of lowland to the west. This narrow lowland is known as the Wetterau, and forms a route from the Rhine rift valley towards the Weser lowlands and the great northern plain (see Fig. 83).

(ii) *The Rhine Plateau.* Below Mainz the Rhine is confronted by the steep edge of the Rhine Highlands, more properly called a plateau, which lie athwart its valley. After skirting the edge of the plateau for twelve miles or so in the region known as the Rheingau, the Rhine proceeds, from Bingen onwards, to flow through the

plateau by means of a gorge some eighty miles long, until just above Bonn it emerges once more on to a plain. The river has here performed the apparently impossible task of carving its way through a mass of hard, resistant rock whose surface lies at an average height of 1,600 feet above that of the rift valley. Obviously, physical conditions must have been different when the river started to flow across this plateau, and the evidence suggests that we have here an old peneplain which began to rise in late Tertiary times, after the middle Rhine drainage had been reversed from a



[Courtesy German Railways Bureau, London]

FIG. 87.—SOONECH CASTLE AND THE RHINE GORGE.

Note the flat top of the Rhine Highlands, and the valley sides terraced for vineyards.

southerly to its present northerly direction. As the Rhine rift-valley sank and the peneplain was uplifted, the river was forced to cut its bed deeper in order to maintain its way. (*Cf.* the passage of the Meuse through the Ardennes, the Elbe through the Erzgebirge.)

The maximum uplift took place in the south, where some of the greatest heights, reaching nearly 3,000 feet, are now found, namely in the Taunus and Hunsrück, just north of the great fault line which marks the southern edge of the massif. Broadly speaking, the massif sinks down towards the north, but it is crossed midway

by an old down-warping running from south-west to north-east and marked by the lower courses of the Moselle (Ger., Mosel) and Lahn, and it rises again in the Eifel, Westerwald, and still more in the Rothaargebirge. The Moselle and Lahn, like the Rhine, have been obliged to incise their valleys in order to maintain their way, and as their lower courses were originally very meandering, the result is a very remarkable series of snake-like twists and turns, especially in the Moselle gorge below Trier (Fr., Trèves). Parts of the valleys of the smaller rivers show similar incised meanders, as in the case of the Ahr and Urft, but generally speaking, the old peneplain character has been fairly well preserved over wide stretches of the present plateau, though it is a fossil peneplain, since the Mesozoic and Tertiary material has been almost wholly removed by denudation. Most of the Mesozoic covering had evidently been stripped off by Tertiary times and is preserved only in the Moselle depression round Trier, and the once complete Tertiary covering is preserved only where protected by the young volcanic deposits. The latter accompanied the dislocations associated with the rising peneplain. Over the greater part of the plateau the old Palæozoic rocks have been exposed once more and consist mainly of slates and shales (Ger., *Schiefer*), though the upstanding ridges are usually formed of quartzites, as in the higher parts of the Taunus, Hunsrück, and Rothaargebirge.

The Taunus and Hunsrück are both forest-covered, but the Eifel has been largely cleared and devoted to agriculture, which, however, is so little remunerative that large tracts have gone out of cultivation and returned to moorland, as in the case of the similar "intake" lands of the Pennines. The Eifel district is one of the few districts of Europe outside the Mediterranean zone in which craters and crater-lakes can be seen, the volcanic activity here continuing from Tertiary into geologically recent times. (*Cf.* the Massif Central of France.) The quarrying of hard lavas is a flourishing industry along the Rhine border. The Hohe Venn (= fen) or foreland of the Eifel is a continuation of the Ardennes and is a moorland area with poor pasture and cattle-rearing. Only the Westerwald region of the Rhine Highlands is of any considerable agricultural value, the presence of weathered young volcanic deposits providing a fertile soil, but owing to the raw climate it is used mainly for pasture. The Rothaargebirge and Siegerland to the north are forested. The old-established iron industry of Siegerland still survives, though the increasing depth and difficulty of mining the iron-ore make its production a costly business.

Beyond the Sieg the plateau sinks down to the Sauerland, which, however, is still forested and of little use for agriculture. Like the

Siegerland, it has some old industries, which have mainly been transformed under the influence of the Ruhr coalfield. (See section on the Lower German Rhinelands, p. 271.)

It is in the narrow valleys that most of the life of the Rhine Highlands is concentrated, and as there is practically no floor to these valleys, either along the Rhine gorge or along the lower parts of the Moselle and Lahn, the steep sides have been terraced, wherever a sunny aspect could be obtained, and devoted to vineyards. The most famous German wines, *e.g.* Johannisberger, come from the slopes of the Taunus overlooking the Rheingau. About two-thirds of the German output of wine comes from these valleys, especially the Rhine, Moselle, Lahn, and Ahr, the remaining third coming chiefly from the foot-hills of Hesse and the Palatinate.

The Rhine gorge, in spite of its narrowness, is one normally of the busiest highways of movement in Europe. Railways follow both banks, while great barge-trains dragged by powerful tugs animate the river. The Rhine gorge from Bonn to Bingen presents a piquant contrast with its romantic castle-crowned crags frowning down upon the bustling modern world at their feet. Between Bonn and Coblenz, the confluence town, where the Moselle joins the Rhine, factories of various kinds are rarely out of sight and villages succeed each other almost without a break. Even in the more unspoilt stretch between Coblenz and Bingen a modern Lorelei would find the sirens and smoke of passing tugs a sad hindrance to her singing. Not only does the Rhine valley give a short, direct north-to-south international route through the Hercynian mountain systems of central Europe, but the richness in agriculture or minerals of the lands on either side further contribute to the amount of traffic, a good deal of which is carried on the navigable Rhine itself. No river in Europe can compete in the amount of traffic carried, although the Rhine has by no means the longest navigable course, being far behind the Volga and Danube in that respect. The main contributor to this traffic is the Westphalian (Ruhr) industrial area which lies on the northern border of the Rhine Highlands.

The Mittelgebirge between the Rhinelands and Bohemia. (i) *The Scarplands of Swabia and Franconia.* This region, which is drained mainly by the Neckar and Main tributaries of the Rhine, has in broad outline a symmetrical and simple structure. Strata of Triassic and Jurassic age have been tilted up towards the north-west and exposed to denudation, so that the younger rocks have been stripped off and progressively older layers have been exposed, the younger rocks remaining in the south-east. The edges of the more resistant rocks stand out as scarps, which face westwards or north-westwards (*see* Figs. 83 and 88).

The geological formations fan out, as it were, from the south-eastern corner of the Schwarzwald, between the old massifs on the west and the Alpine Foreland on the south-east. Starting from the north-west, the Bunter sandstone of the Lower Triassic has already been mentioned as covering the infertile forested eastern slopes of the Schwarzwald, Odenwald, and Spessart. This is succeeded by the Middle Triassic measures, mainly represented here by the muschelkalk, a shelly limestone, which together with the Keuper marls (Upper Triassic) on its eastern flank form the highly cultivated *Gäue* country, though the fertility is largely to be attributed to old river alluvium which overlies both formations and which resembles löss in its appearance and properties. Bordering these plains eastward is the scarp-line formed by the edge of the Upper Triassic sandstone (*Stubensandstein*), a scarp which has an exceedingly discontinuous and uneven front, especially in the south-west of Swabia (Ger., Schwaben), but is somewhat more regular, though lower, farther north in the Frankenhöhe and Steigerwald of Franconia (Ger., Franconien). In places this scarp reaches 600 feet above the plain, but is usually only half that height and so irregular that its character is often difficult to perceive on the ground.

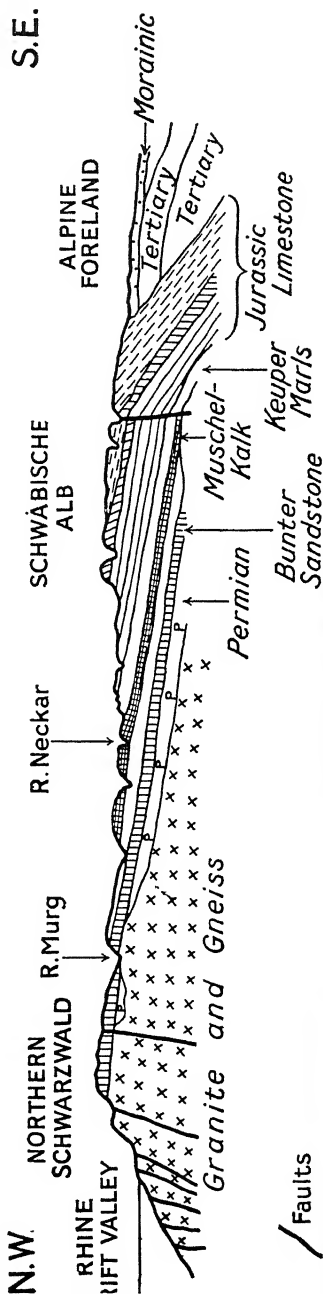


FIG. 88.—SECTION ACROSS THE SCARPLANDS OF SOUTH-WESTERN GERMANY.

the Upper Trias quickly sinks in Swabia under Liassic marls which again offer very fertile soils, but in Franconia the sandstone outcrops over a wide area and presents a sterile soil mainly under pine forests, and the Lias belt is very narrow. Above the Lias beds rises the very considerable scarp of the Swabian and Franconian Jura,¹ formed principally by hard white limestones, but even this scarp is not continuous, being interrupted, *e.g.* by the depression of the Ries between the Swabian and Franconian sections, and although the edge sometimes attains a height of a thousand feet or so above the plain, yet it is considerably frayed by erosion. Outliers often stand in front of the main scarp and are often crowned by castles, *e.g.* the castle of Hohenzollern. The limestone of the Jura forms a plateau of considerable elevation, the true *Alb*. Owing to a fracture it sinks rather rapidly on the southern side under the Tertiary and glacial accumulations of the Alpine Foreland.

The river system of the scarplands is particularly complex, owing to the fact that there has been a considerable reversal of drainage. The rivers in early Tertiary times apparently flowed down the dip-slope towards the Danube, but the development of the Rhine rift attracted drainage in that direction, as the floor of the rift is several hundred feet lower than the upper Danube valley. Accordingly a complicated series of river capture took place, which accounts for the numerous elbows of capture. Naturally, also, the introduction of a lower base-level of erosion led to the incising of the rivers in their valleys, the steep sides of which, often devoted to vineyards, recall the Moselle valley in miniature. The earlier Tertiary peneplain surfaces, however, have not as yet been greatly affected by erosion, hence the generally level appearance of the uplands and the survival of old river alluvium.

The scarpland region is not very low-lying; even the *Gäue* plains are at a height of nearly 1,000 feet above sea-level, and the *Alb* reaches over 3,000 feet in the south-west, though it is under 2,000 feet in the north. The relatively southerly latitude, however, from 48° N. to 50° N., together with the protection offered to the plains by the Schwarzwald, Odenwald, and Spessart, give the lower lands a favourable climate in which wheat, orchards, and tobacco all flourish, and the vine and maize succeed in favoured places. Even the *Alb* plateau, though possessing a raw climate (*cf.* the *Rauhe Alb* of the Swabian Jura), is mainly arable, though there is a difficulty in obtaining water owing to the depth of the water-table.

Minerals are scarce in the scarplands, but the lithographic stone or Solnhofen slate of the Franconian Jura may be mentioned, as it

¹ The name Jura is being superseded in Germany by the old local term *Alb*, *e.g.* Schwäbische Alb, Fränkische Alb.



[Courtesy German Railways Bureau, London]

FIG. 89.—VIEW IN ROTHENBURG ON THE TAUBER.

is still used to some extent. Small deposits of iron-ore are found in the Dogger sandstone of the Jurassic system, but are no longer of importance, and salt and gypsum are found in the Keuper series (*cf.* Cheshire salt mines).

The old towns of this region are numerous and beautiful. In the Middle Ages they were partly local market towns, but also active participators in the trade that crossed Europe from the Mediterranean to the North Sea lands. Hand industries were important, especially the metal industry, and also textiles, working chiefly flax.

With the coming of railways, modern industries have been established, in spite of the absence of coal and raw material, but naturally the heavy industries are not represented. Some local agricultural produce is manufactured, and still more, such articles which take little raw material but are of high value when finished, such as textiles, leather goods, machinery, watches, optical and musical instruments. The industrial centres have generally remained rather small and are localised chiefly in Swabia (modern Württemberg), along the middle Neckar valley, and along the nearby foot of the Swabian Jura. Stuttgart is the centre of the Neckar industrial region, which extends principally between Heilbronn and Plochingen, and the line is continued up the Fils valley from Göppingen to Geislingen. Stuttgart (414,000) is the only large town, and though it owed its foundation by the rulers of Württemberg to its pleasant site on the *Stubensandstein* scarp, yet with the advent of the railway it became the main seat of industry in the south-western scarplands, its Daimler-Benz motor cars and "Bosch" magnetos being especially well known.

In the Franconian or north-eastern section of the scarplands Nuremberg (Ger., Nürnberg; 322,000 in 1947), together with its suburb Fürth, concentrate most of the industrial development, though Würzburg and Schweinfurt have engineering industries, the last named town being noted for ball-bearings. Nuremberg's manufactures are very varied, but metallurgical products take first place, and include machinery, motor cars, bicycles, and toys. In spite of its large size the city managed to retain, until the war of 1939-45, much of its picturesque mediæval appearance, which recalled the fame of the city through its mediæval trade with Venice and through its remarkable sixteenth-century metalwork. It naturally attracted many tourists, who also flocked to the other old towns of Franconia, of which Rothenburg is perhaps the most picturesque.

Owing to the smaller industrial development and the wider outcrop of the poor *Stubensandstein*, Franconia has fewer people per square mile than Swabia. The loam-covered lands of Swabia seem to have had only a scanty forest cover in Neolithic times and

to have early attracted a settled population. Like the Rhinelands, Swabia was inside the Roman Empire and was the land of the Suevi and Allemanni.

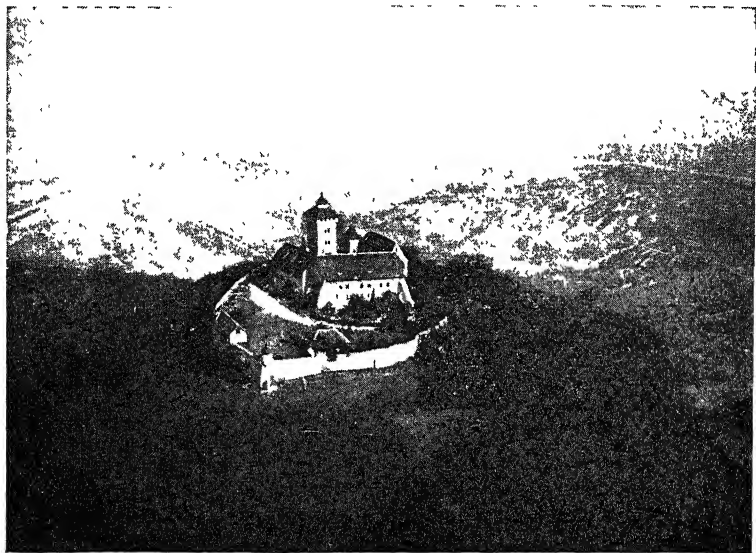
(ii) *The Uplands and Plains of Hesse and Thuringia.* This region of forested uplands and narrow but fertile plains seems at first sight a patternless mosaic of small land-forms. It does, however, represent the continuation both of the Rhinelands and of the scarplands, but the symmetry is disturbed by Tertiary volcanic outpourings, by complicated faulting, and in the north even by considerable folding (see Fig. 83).

The Hessian "Corridor" Lands. In the west these lands are bordered by the Rhine Massif, east of which lies the continuation of the Rhine rift valley known as the Wetterau (see section on Rhine Rift Valley). Though interrupted by the dissected volcano of the Vogelsberg, the rift is continued still farther northwards towards Kassel (126,000), an important route centre on the Fulda tributary of the Weser. A much used corridor skirting the Vogelsberg is afforded by this rift, which like that of the middle Rhine is filled with Tertiary deposits, generally of considerable fertility.

East of the rift the main floor of this region is formed by Bunter sandstone, thereby continuing the line of the Odenwald and Spessart. The sandstone, as usual, provides but a poor soil and has been left under dense forests. Sporadically, however, cappings of Keuper marl remain, as, for instance, to north and south of the volcanic Rhöngesbirge (3,117 feet) and north-east of the Teutoburger Wald, and these afford better soil. The river valleys are also fertile, besides offering routeways, e.g. the River Fulda with the town of Fulda between the Vogelsberg and Rhöngesbirge.

Thuringia. The salient of the Thuringian Forest (Ger., Thüringer Wald) acts as a separating wall to some extent between the uplands and "corridors" of Hesse and the rather lower and more fertile lands of the Thuringian basin to the east, the latter having some unity through being drained by the River Saale and its tributaries. The Thüringer Wald itself is a typical Hercynian horst and is bounded to north-east and south-west by fault-lines. It reaches a height of just over 3,000 feet and, as its name implies, is heavily forested. In spite of this apparently unfavourable environment it supports a considerable population, which is engaged mainly in manufactures demanding much skill and patience, such as fine metallurgical work, glass-work and porcelain for medical use (thermometers, etc.), and the well-known dolls' heads. The population was formerly dependent upon local iron and copper mining and working, and turned to other forms of industry as these deposits became exhausted.

North-east of the Thüringer Wald lies the structural basin of Thuringia. Here are preserved the muschelkalk and Keuper beds of the Triassic system, and in places also even Jurassic and Cretaceous rocks. The muschelkalk forms a low and much interrupted scarp, facing outwards almost all round the edges of the basin, but the structural harmony of the basin itself has been disturbed by dislocations and flexures caused by the pressure of the adjacent horsts. The basin, with its fertile degraded *chernozems*, provides rich agricultural land and possesses several cities of fair size. Erfurt



[Courtesy German Railways Bureau, London]

FIG. 90.—WACHSENBURG NEAR HOLZHAUSEN, THURINGIA.

The castle-crowned crag, overlooking highly cultivated, hedgeless and treeless plains, presents a scene very characteristic of Thuringia and Hesse.

(167,000 in 1939), the largest, is a commercial and industrial city, with somewhat the same industries as those of the Thüringer Wald; Weimar (associated with Goethe and Schiller) and Gotha¹ remained just under 50,000. Jena was famed for its optical instruments (Zeiss) and its university.

The rest of the country between the Thüringer Wald and the Harz Mountains is mainly covered by the infertile Bunter sandstone, but the Goldene Aue is a little rift valley in which fertile Tertiary

¹ Among the many establishments removed to the U.S.S.R. at the end of the war was the famous Justus Perthes Geographical Institute of Gotha, together with its personnel.

deposits are preserved and which is renowned for its rich agriculture. The Thuringian Forest and Basin, together with the Goldene Aue and the Harz mountains, are in the Russian Zone.

The isolated Hercynian horst of the Harz Mountains still largely retains its peneplain character. About half the area remains under forest, the rest of its mainly undulating surface being cultivated for hardy crops, such as hay and potatoes. A considerable number of small towns on the margins carry on industries somewhat similar to those of the Thüringer Wald and present a somewhat similar history of a population formerly engaged in mining, here mainly for silver, who turned to manufacturing as the mines failed. Copper is still worked near Eisleben on the eastern side of the Harz.

Bordering the Hesse-Thuringian uplands on the north are a number of short, low chains, which represent earth ripples connected with the re-elevation of the Hercynian horsts. Little denuded anticlines are frequent, like those of our own Weald, and are of similar late Secondary or early Tertiary date, with the muschelkalk, Jurassic or Cretaceous limestones standing up above the clays and marls exposed at their feet. The little chains of the Weser Hills extend on either side of Minden on the Weser, which cuts through them at the Porta Westfalica.

(iii) *The Borders of the Bohemian Massif.* The German frontier on the south-east runs along the mountains bordering the Bohemian basin. The Bohemian Forest (Ger., Böhmer Wald) on the south-west of that basin presents its steep side to the Regen valley and is a scantily peopled forested region of rounded mountains composed of granites and gneisses. The gap of Furth, traversed by rail, separates it from the Forest of the Upper Palatinate (Oberpfälzerwald), which is somewhat lower and less desolate. Between these mountains and the Franconian Jura lies the hilly basin of the Upper Palatinate, drained by the River Naab. The basin is a denuded anticline, whose considerable elevation (mainly over 1,300 feet), heavy rainfall and heavy soils (derived mainly from Keuper marls and Lower Cretaceous clays), conspire to produce a pastoral country with considerable forest.

(iv) *The Saxon Uplands.* The Erzgebirge and their German foreland, which formed the old kingdom of Saxony, present a contrasting picture to the above. The main fault-lines and the abrupt descent are on the Bohemian side and the ascent from Germany is relatively gradual. The name Erzgebirge ("Ore Mountains") indicates the considerable metallic wealth of silver, copper, and lead which formerly attracted a German population on to the heights, and though these ores are no longer profitable to work, there is some uranium mined. The lower slopes, which represent a dissected

plateau, merging northwards into a plain, were cleared for agriculture, but the main riches of this area at the present day lie in its industrial development.

The manufactures of this region show the influence of historic momentum, since they grew out of home industries and small concerns using crude water-power, and pre-date the development of the small coalfields near Zwickau and Dresden, and, of course, the more recent development of electric power derived from lignite. The main industry was the textile, which developed out of an old hand-industry, which in turn seems to have been adopted as a supplementary means of livelihood in a somewhat over-populated district. Wool was the principal textile originally, and the merino sheep of Saxony, introduced from Spain in the eighteenth century, were among the ancestors of the present flocks in Australia. Chemnitz (335,000 in 1939), often called the "Manchester" of Germany, was the great centre of the industry, which included the spinning, weaving and dyeing of cotton, linen, jute, and artificial silk, and the manufacture of knitwear, but the industry was also widely diffused throughout the countryside of the Erzgebirge and Vogtland, and in the angle between them, factories being found in many small towns and villages. A large number of home looms persisted, though in recent years they were driven by electricity, as in the textile region of the French Massif Central round St. Etienne. Plauen (110,000 in 1939) and the Vogtland district generally specialised in net, lace, and other "Nottingham" products. Metallurgical work of the finer kind, particularly the manufacture of machinery, including textile machinery, took second place.

In some respects this industrial region of the former kingdom of Saxony may be looked upon as forming part of a greater region, which includes the Leipzig bay of lowland lying mainly in the old Prussian province of Saxony, though the genesis of their industrial development was different. Agriculturally the northern and lower parts of the "kingdom" of Saxony continue the wheat and sugar-beet lands on the löss belt already mentioned as bordering the north German plain.

The city of Dresden on the Elbe owed a good deal to the kings of Saxony, who made it their royal residence. It reached its large size (625,000 in 1939) through its commercial activities, and as the political and cultural centre of a densely populated industrial area. Its industries included machine tools, precision instruments and other metallurgical work, optical and electrical goods, and a wide variety of "consumer" goods.

The River Elbe breaks through the mountain border of Bohemia into Germany *via* a zone of structural weakness, where the old

crystalline core had been downfaulted before Cretaceous times, and the depression filled up by a great thickness of Cretaceous clays and sandstones, which have here been preserved. The upper layer of sandstone has often weathered into fantastic forms, particularly into stacks or pillars of rock, which have given rise to the exaggerated and misleading title of "Saxon Switzerland."

B. THE ALPINE FORELAND IN GERMANY

This is a continuation on a larger scale of the Alpine Foreland in Switzerland and Austria. The geosyncline to the north of the Alps has been filled in by masses of material known as *molasse*, which were weathered from the great chain during Tertiary times, and by the products of later erosion, especially during the great Ice Age. The Foreland generally forms a plateau of little relief, which though about 1,000 to 3,000 feet above sea-level, has often the appearance of a plain, though it is dissected into hills in the north-east.

West of the River Lech the plateau is narrow and the *molasse* has been completely covered by glacial material, mainly gravels. In the southern part the impress of the most recent glaciation is still very clear, and tongue-basins with morainic walls and outwash plains are common. The soils are generally poor, and the climate owing to the elevation and northward slope is cold and wet, so that agriculture is confined to hardy crops and pasture, and considerable areas are forest-covered.

East of the Lech young glacial material and glacial landforms, including tongue-basins, are found in the south, older glacial gravels appear in the middle, and the *molasse* at the surface farther north. The *molasse* has been slightly dissected by the rivers into hills, and its fairly fertile, though heavy soils give rise to considerable agriculture. The middle zone of gravels bears large stretches of swamp, forests, and heathlands. It is in this unfavourable zone that Munich (Ger., München; 761,000 in 1947) is found. Like so many German cities, it owed its growth to princely caprice, being chosen as capital and royal residence by the rulers of Bavaria (note its repute as a musical and artistic centre), but its present size is mainly due to its industrial and commercial development. It is the largest city of southern Germany, and apart from Augsburg it is also the only great city of this extensive natural region of the German Alpine Foreland, which is generally lacking in raw materials and labour, and also in motive power, apart from water. Such industries as exist are concentrated in the towns, particularly in Munich, which to an old brewing industry has added electrical, textile, and mechanical industries. Munich is also well known as a centre for technical education.

Augsburg (168,000 in 1947), at the confluence of the Lech and the Wertach, was a well-established town dating from Roman times when Munich was a mere crossing-place on the Isar for the salt route from Salzburg. It enjoyed great prosperity in mediæval times as a trading city connected with the forwarding of eastern goods from the Mediterranean *via* the Brenner and Fern passes from Venice and *via* the Bündner pass from Genoa, but it has suffered in modern times from the attractions of its rival and neighbour.

Economic Summary. Germany was the most highly industrialised

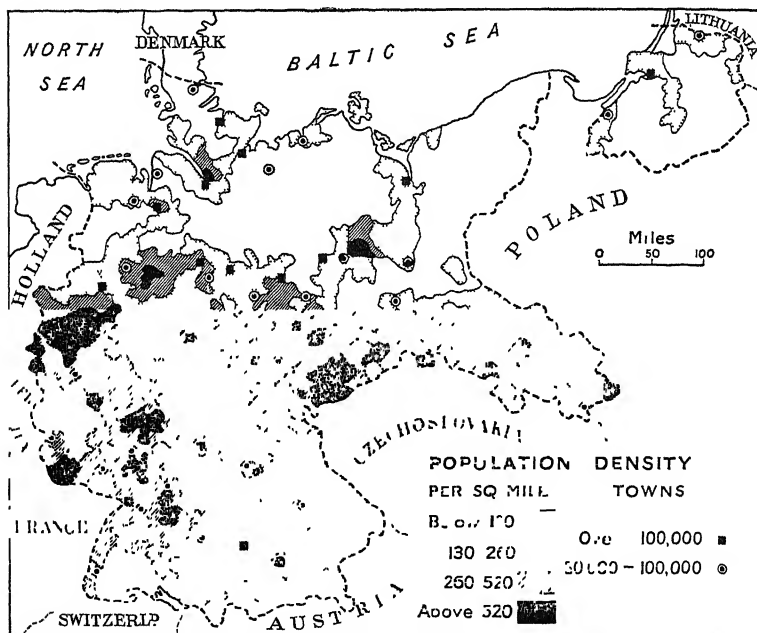


FIG. 91.—POPULATION MAP OF GERMANY (1933).

country of Europe in 1939, with the exception of Great Britain. Fifty-seven per cent. of the employed population were engaged in industry and commerce and only 18 per cent. in agriculture and forestry. This industrial development was based chiefly on the large resources of bituminous coal, lignite, common and potash salts, and iron-ore.

Germany's coal reserves were the greatest in Europe in 1913 and amounted to about 40 per cent. of the total for the whole continent, whereas those of the United Kingdom were about 34 per cent. With the loss of part of the Silesian coalfield to Poland the reserves dropped to about 24 per cent., and have dropped

still farther with the loss of the rest of the Silesian coal. In regard to the output of coal, Germany held the second place in Europe and the third in the world from the formation of the *Reich* onwards, the output amounting to 190 million tons of bituminous coal in 1913 and 186 million tons in 1937. The output of lignite increased from 87 million tons in 1913 to 137 million in 1934, and 193 million in 1938, and this fuel is largely used for conversion into electrical energy. In addition, hydro-electricity has been developed on a large scale since 1918, over a million horse-power being made available. Germany's salt deposits have also been of great value in the development of modern manufactures, particularly the chemical industry, in which before 1914 Germany held the leading position, since challenged by the U.S.A. and Great Britain. Eleven million tons of potash salt and three million tons of common salt were produced in 1936. Before the war of 1914-18 no other country in Europe had any considerable output of potash salts, only two sources of supply being known, those of Stassfurt and Alsace, but the German monopoly was broken with the return of Alsace to France, and the development of the Solikamsk deposits in U.S.S.R. After 1918, also, Germany's resources in iron-ore were much reduced, as these were mainly situated in Lorraine, part of which had been seized by Germany in 1871, but surrendered in 1919. The output of iron-ore in 1938 amounted to 11 million tons, as against 28 million tons in 1913, so that Germany, like Great Britain, had to import large quantities of iron-ore and scrap. Germany in 1938 was the chief European producer of pig-iron. Zinc and copper occur in considerable quantities, but Germany's superior natural endowment was mainly in the form of motive power, in which respect the country was probably the richest in Europe, though lacking in mineral oil. (*See Appendices B and C.*)

Apart from mining and the heavy iron industries, the most important branch of industry was the metallurgical, including the making of machinery, shipbuilding, cutlery and fine steels, and electrical, optical, and surgical instruments. The important chemical industry, which included the manufacture of dye-stuffs, artificial fertilisers, synthetic oil and rubber, textiles, plastics, and many other products, has already been noted. Glass-making was also of considerable importance.

In textiles, Germany did not hold such a dominating position as in the metal industries, but nevertheless ranked high among European producers. In amount of raw cotton manufactured in 1933-34 it held third place in Europe, with a consumption of 1.5 million bales, Russia holding second place with 1.9 million bales, and Great Britain first with 2.5 million bales.

The manufacture of the agricultural and forest products of the country was widely disseminated and of considerable importance, principally for the home market. There was an export of sugar, however, from home-grown sugar-beet, as Germany was the leading producer of beet-sugar in the world and had a substantial surplus.

With the development of industries, however, the Germans did not neglect their agricultural and forestry resources. Sixty-one per cent. of the total area was under cultivation, of which five-sevenths is arable, while twenty-seven per cent. was under forests, the latter being noted for the excellent way in which they were managed. Owing to the large numbers of industrial workers, however, Germany was not self-sufficing in foodstuffs.

German exports before the 1939-45 war consisted almost entirely of manufactured goods, principally iron and steel goods, textiles, coal, chemical products, paper, dyestuffs, copper goods, and glass ware. The imports were mainly foodstuffs, such as coffee, butter, and wheat, and raw materials, such as raw cotton and wool, mineral oil, coal, copper, timber, and iron-ore.

Footnote, February, 1949

The seizure of eastern Germany by the Poles, the post-war division of the rest into four zones of occupation, the lack of co-operation between the U.S.S.R. on the one hand and the American, British and French occupying-powers on the other, have all contributed to disintegrate Germany and to disrupt German economic life to an extent never experienced by a European power in modern times.

Nevertheless, a recognisable pattern seems to be emerging. The economy of the Russian zone has undergone great change, in that factories have been dismantled on a large scale, and machinery and personnel carried off to the U.S.S.R. Bizonia and the French zone together have received some seven million German refugees from eastern Germany, with the result that these western areas are now even less self-supporting in food than in pre-war days. Hence it seems essential to allow the rebirth of industry so that the Germans, by means of exports, can pay for imports of food, which were costing the occupying powers millions a year. Will a revived western Germany become once more a great rival of the other manufacturing countries of Europe in the export market?

REFERENCES

Germany, by R. E. Dickinson (London, 1953) is the best modern text-book in English. *Deutschland*, by G. Braun (Berlin, 1916), is another good book. A much enlarged edition was published in 5 parts in 1926-36. The compilation *Deutschland* in the E. von Seydlitz'sche Geographie, Hundertjahr-Ausgabe (Breslau, 1925), is also sound and contains a profusion of photographs and diagrams. J. Walther's *Geologie Deutschlands* (2nd ed., 1912) is a standard work.

The following series is recommended: *Landeskunde von Deutschland*, edited by N. Krebs, 4 vols. (Berlin); *Der Nordosten*, by B. Brandt (1931); *Der Südwesten*, by N. Krebs (1931); *Der Nordwesten*, by Hans Schrepfer (1935); *Der Südosten*, by F. Metz; *Süddeutschland*, by R. Gradmann (2 vols., 1931).

The Regions of Germany, by R. E. Dickinson (London, 1945), discusses the question of a division of Germany into political units on the lines of economic regions. See also "The Ruhr Coal Mining District," by C. Harris in *Geog. Review*, 1946

CHAPTER XXI

POLAND

Historical Foreword. It is impossible to understand the geography of Poland without knowing something of the main events in its history. Between the years 1795 and 1919 there was no independent state of Poland, except for the Grand-Duchy of Warsaw (1807-15) and the small republic of Cracow (1815-46) and the land was divided between Russia, Germany, and Austria. Before the partitions of 1772, 1793, and 1795, the kingdom of Poland had had a long tradition behind it, dating from the tenth century, and had acted for centuries as one of the bulwarks of western Europe against invasions of Tatars, Turks, and other such intruders from the south-eastern steppes. Even as late as 1683 a king of Poland (John Sobieski) came to the rescue of Austria and Christendom when the city of Vienna was closely besieged by the Turks and seemed doomed to capitulate. The traditional rôle of Poland, however, was not only defensive. It shared in the general forward movement towards the east on the part of all the great nations of the plains north of the Alps. The French aimed at reaching the Rhine, the Germans (Austrians, Prussians, and others) pushed forward among the Slavonic-speaking peoples, and in turn the Poles advanced still farther east into territory which was inhabited by Russians. A word of explanation is necessary to show how this came about.

It happened that from the fourteenth century onwards Poland was dynastically linked with Lithuania, its heiress having married the ruler of its eastern neighbour, the Grand-Duchy of Lithuania. The latter State had previously extended its rule south-eastwards over large numbers of people who were not Lithuanians, but who spoke Russian dialects and were known as White Russians and Ruthenians, the latter sometimes called Ukrainians. In the former Grand-Duchy the Poles had a favoured position, partly on account of Poland being the dominant partner and partly on account of their superior culture, and Polish nobles became overlords over large tracts of land, Polish traders became numerous in the towns, and Polish became the language of the educated. To a less extent, Poland proper had also expanded towards the south-east to include the Ruthenians of East Galicia.

From the beginning of its history Poland represented ideas—later crystallised into tradition—which were neither German nor Russian. Although the Poles and Russians both speak Slavonic languages, yet the two peoples derived their civilisation from the Mediterranean by different roads, Russia *via* Constantinople and Poland from Italy, and this gave the two countries a different bias from the start. Poland, on the other hand, though welcoming German settlers at one time, was thrown on the defensive against German ideas owing to the aggressiveness of Prussia, which, moreover, was a Protestant state from the sixteenth century onwards, while Poland remained Roman Catholic.

With the collapse of Russia and the Central Powers towards the end of the war of 1914–18, it became possible for Poland to be reconstituted, but the hundred years and more of partition had left their mark and accentuated the differences already existing between eastern and western Poland. This hundred years had been one of great change in western Europe, but by far the greater part of the former kingdom of Poland was under Russian rule during that period and shared in the relative stagnation of the latter country. Even in the west, in Poznań and Upper Silesia, though great economic progress was made, the large landowners were mainly German and there was a lack of Polish leadership which alone could have brought about a vigorous improvement in education and in the general standard of living.

The boundaries of the Poland as reconstituted in 1920 reached to the Baltic Heights on the north and the Carpathians on the south. To east and west, the absence of definite limits, either physical or ethnic, made the determination of satisfactory frontiers extremely difficult. On the west and north-west some 740,000 Germans were included in the new Poland (1931 figures), while some 148,000 Poles remained in Germany. On the east there was the difficulty of balancing historical against ethnic claims in an area where national feeling among the peasants appeared to be little developed. The "Curzon Line," a suggested frontier planned to run from north to south through Brest Litovsk (Polish, Brześć-na-Bug), would have excluded from Poland the Pripet marshes with their majority population of White Russians as well as East Galicia with its Ukrainian-speaking people, but this frontier proved unacceptable to Poland on various grounds, partly historical, partly strategic, and partly because the landowners and townsfolk were largely Polish.

Danzig and the Polish Corridor. On the north it is significant that Poland's 1918 frontier did not reach the sea except along a narrow corridor between East and West Prussia. This continued the long historical divorcement of the Poles from the sea, the Slavonic-

speaking peoples in general being landmen, not seamen. The town of Danzig near the mouth of the Vistula was, of course, the obvious sea outlet for the Vistula basin which forms the homeland of the Polish people, but its population in 1918 was 90 per cent. German. In consequence, it was declared a Free State in 1919, together with a small area of land surrounding it, though it was included within the Polish Customs Union. This solution pleased neither Poles nor Germans, and the Poles set about building a new port, named Gdynia, on their short stretch of Baltic coast, to which access was provided *via* the narrow Polish Corridor, only about thirty miles wide.

The New Frontiers of Poland. The traditional instability of Poland's frontiers was manifested again, both during the war of 1939-45 and on the collapse of Germany in the latter year. During the war, Germany and the U.S.S.R. came to an agreement to divide Poland between them and carried this out in 1940. At the end of the war Poland accepted the "Curzon Line" as her eastern boundary, *de jure*, and was recompensed by the *de facto* receipt of most of East Prussia, the Free City of Danzig, and a large slice of eastern Germany, as far west as the line of the Oder-Neisse rivers.

Poland a Transitional Area. The concept of Poland as transitional between central and eastern Europe is a useful one, since transition is the keynote of so many aspects of its geography. There is a rapid increase in the severity of the winters from west to east in Poland, to such an extent that the icy hand of the true Continental winter is felt in the east, where on an average three to four months have a temperature below freezing. Culturally, there is a progressive falling-off in the degree of economic development, in the density of population, in the number of towns, and in the standard of living from west to east, though this is less marked in the south, on the löss soils of Galicia. Broadly speaking, Poland is transitional between an eastern Europe which is a massive continental area of continuous lowland, and a central Europe which is under semi-oceanic influence and is of very varied relief.

GEOGRAPHICAL REGIONS

Four main types of physiographic region are found in Poland, arranged in zones running from east to west. In the north there are (a) the Baltic Heights, similar to those of Germany. These are succeeded farther south by (b) the great central lowlands with their *urstromtäler*, here called *pradoliny*, and basins. These again are followed on their southern side by the (c) Hercynian Uplands, including the sub-Carpathian depression and the Silesian

bay of lowland, while the southern borderlands of Poland are formed by the (d) northern chains of the Carpathian Mountains, which belong to the Alpides system. Poland, therefore, comprises the same types of morphological structure as are found in Germany, arranged in the same order, with the difference that there is much less contrast between the great lowlands and the Hercynian Uplands. The uplands consist mainly of low, level plateaus, generally below 1,000 feet, and as treeless as they are highly cultivated. Apart from the Łysogóry, which is partly forest-covered as the name implies, there are none of the rugged, forested horsts which are such a feature of the German "Mittelgebirge." These plateaus were sufficiently low to be lightly strewn with glacial material in the maximum advance of the Scandinavian ice-sheet, but later were covered with thick deposits of lóss, sometimes reworked to form *limon*. In many respects they form a continuation of the great agricultural plains of central Poland.

The Baltic Heights and the Coastal Zone. To east and west of the lower Vistula below Bydgoszcz (formerly Bromberg; 135,300¹) stretch the extensive morainic lake plateaus of East Prussia and Pomerania (including West Prussia). Seldom rising above 1,000 feet, their variety derives mainly from differences of soil, resulting in varied land uses, with forest, especially on the terminal moraines and sandy outwash-plains on the south, meadows in the wetter patches, and expanses of cultivated land on boulder clay. The surface is generally undulating, but in places develops many minor inequalities of relief, especially in the south where terminal moraines and lakes are especially well developed. The beautiful Masurian lakeland of East Prussia is well-known, the lakes filling hollows apparently formed by sub-glacial streams. Although farming is fairly remunerative, especially for potatoes and livestock (pigs, cattle, horses), yet the population density is rather low, and there is a notable absence of towns.

Even the coastal plain on the seaward side of the Baltic Heights, with a higher percentage of fertile boulder clay, shows a mainly rural population, partly to be connected with the large estates, whose break-up began only after 1918, and partly with the absence of good harbours along this smooth concordant coast.

Danzig (Polish, Gdansk; 118,000) and Gdynia focus the urban and commercial life of northern Poland, by virtue of the excellent route afforded by the lower Vistula and its valley, and of the facilities for harbour building, though neither port is really first class. Danzig lies on an arm of the Vistula delta and can take only moderately-sized vessels; its tonnage in 1938 amounted to 7 million tons as against

¹ Population figures are for 1946 unless otherwise stated.

9 million tons for the new port of Gdynia, which was constructed after 1919. Elsewhere the dune-edged coast of Pomerania and the *Haff* and *Nehrung* coast of East Prussia afford no good harbours, except at Königsberg¹ on the River Pregel, now within the U.S.S.R.

The Central Lowlands. The morphological development of the central lowlands of Poland has already been described (*see* Chapter XVIII). As in the similar lowlands of Germany, the main drainage, here by the River Vistula, is from south to north, with *pradoliny* running from east to west. The Netze-Vistula-Narew-Biebrza-Niemen line, now canal linked, may be specially noted, and also the Warta-Bzura-Vistula-Bug line farther south. Compared with the German lowlands the *urstromtäler* are less numerous and there are greater areas of ground-moraine between them.

The monotonous plains of northern Poland present much the same series of pictures over hundreds of miles, the same flatness, even the valleys being barely below the general level and the terminal moraines seldom above it, the same wide expanses of cultivation on the ground-moraine, the same coniferous forests, sometimes cleared, on the *sandr* and terminal moraines, the same alternation of sand-dunes and marshes, sometimes reclaimed, in the *pradoliny*. Only a few areas show any departure from this general sameness, and in most cases it is rather a variation in economic development or in type of population than of physical features.

Lowlands West of the Vistula. There are some slight regional differences to be observed between the area looking to Poznań (268,000) as its centre, and that looking to Łódź (497,000). The Poznań area, though having a higher percentage of infertile marshy and sandy tracts than the Łódź area, was noted for its great agricultural productiveness. This in turn seems due to the fact that agriculture was better organised in the German Empire than in the Russian, and this province, under the name of Posen, was German from the second partition of Poland in 1793 down to 1919. The same crops are cultivated as elsewhere in the glaciated plains, with rye and potatoes in a leading position, but wheat, sugar-beet, cattle, and pigs achieve considerable importance, and the standard of farming and the yield of production are high. The use of chemical fertilisers is widespread and a good railway network facilitated the collection and despatch of the agricultural products to the cities of northern Germany which were the chief markets before 1914. The population, however, remained overwhelmingly Polish, since large estates with Polish labourers were the rule, and though the cities contained considerable numbers of Germans, these were never in the majority and few remained after 1918.

¹ Now Kaliningrad.

In spite of the considerable density of population (213 per square mile) there is only one large city, namely Poznań itself, situated on the River Warta. It is a regional capital and the only manufacturing town of importance in the area. It has various industries connected with agriculture, such as the manufacture of agricultural machinery, chemical manures, flour-milling, and brewing.

Thirty to forty miles east of the town of Poznań and north of the River Warta is the Polish lakeland, apparently similar in origin to the Havel-Spree lakeland, *i.e.* formed by sub-glacial erosion. The area is interesting as containing black loams of unknown origin, which, it is claimed, formed one of the few non-forested areas of



FIG. 92.—PLANTING SUGAR-BEET IN CENTRAL POLAND, PROVINCE OF WARSAW.

early Poland, that is to say, before the tenth century A.D. Here also the glacial cover is only about 10 to 20 feet thick, and salt deposits were accessible below, and these gave the region an early importance. The region is said to be the cradle of Polish nationality and the place of origin of the Piast royal family.

The Łódź area, on the high plain or low plateau between the Vistula and Warta-Oder river systems has an exceptionally large proportion of fertile boulder clay and a high density of population. The town of Łódź, the main centre of the Polish textile industry, was a nineteenth-century artificial creation on the part of textile manufacturers, mainly German, who wished to take advantage of its position in former "Congress" or Russian Poland, inside the

tariff wall, and so have the advantage of the vast Russian market. There is a large ready-made clothing industry, particularly associated with the Jewish population. The only other town of any size is Radom (about 78,000 in pre-war days), about eighty miles south-east of Łódź, and also of carrying on textile industries.

The Valley of the Middle Vistula. The distinctive feature of this sinuous valley is the marshy flood-plain, margined by dry, fertile river terraces. In places the valley widens, as in the ancient lake basins of Warsaw and Płock, where water was dammed up in front of the ice-sheet. (See Chapter XVIII.)

The Vistula itself is braided in many places and flows through a



[Courtesy Polish Embassy]

FIG. 93.—RAFTS ON THE VISTULA NEAR TORUŃ.

broad valley, originally marshy and still very liable to floods. Elsewhere in the valleys sand-dunes have been piled up, particularly on the eastern side, and these provide dry material, it is true, but generally quite useless for cultivation.

The distinctive human feature of this area is the city of Warsaw (Polish, Warszawa), with over a million inhabitants before 1939, but only 479,000 in 1946. The city became the capital of Poland only at the end of the sixteenth century, the former capital having been at Cracow in Galicia. The city itself has a good site on a terrace on the left bank of the Vistula, above the level of flood, and at a point where the absence of marshes gave a fairly easy crossing.

The central position is also good, and it may perhaps be said that any suitable site near that position would have given rise to an important town. To-day Warsaw is the administrative and commercial centre of Poland and an important industrial city, manufacturing, in particular, textiles and machinery.

Between Warsaw and Danzig are several ancient towns, of which the most noteworthy are Bydgoszcz and Toruń, perhaps better known by their German names of Bromberg and Thorn. Bydgoszcz, with timber and engineering industries, owes much to its position near the junction of the Vistula River and Bromberg Canal. Toruń (about 54,000 in pre-war days) is renowned as the birthplace of Copernicus.

Lowlands East of the Vistula. The lowlands are here known as Podlasia. They are not so low-lying as the region to the west of the Vistula, and they are lightly dissected by river valleys. This area formed the old water parting between the Vistula and the Dnieper river systems before the Polish River Bug captured the upper waters of the Pripet River, a tributary of the Dnieper. There is little ground-moraine here, but much sand and gravel; in consequence a good deal of land is still under forest, and the typical crops are rye, potatoes, and flax. The somewhat sparse population is distinctly poorer and more backward than that of the Poznań and the Łódź areas. Towns are few and small, and have, or had, a large Jewish element.

THE HERCYNIAN UPLANDS

South of the northern plains there is a band of country, some 100 miles wide from north to south, which has at least a few recognisable lines of relief and where the physiognomy is based on a less haphazard distribution of the subsoil. From east to west there stretches a series of low plateaus and basins, mainly developed on Cretaceous measures which have usually been little disturbed. The resurgence of two old Hercynian blocks, however, has caused a tilting of the overlying strata west of the Vistula and has also caused denudation to expose (a) the Mesozoic rocks whose Jurassic limestones on the west form the Częstochowa-Cracow scarp and (b) the Palæozoic rocks in the Łysogóry east of Kielce and in the Silesian coalfield. East of the River San, also, the Cretaceous measures have been warped to cause the anticline of Rostocze running north-westwards from Lwów (better known as Lemberg). This belt may conveniently be called the Polish scarplands, though, as in the scarplands of Germany, the wide plains rather than the escarpments form the conspicuous feature over the greater part of the area.

South of these Polish scarplands is a geosyncline, apparently corresponding to that of the Alpine Foreland and similarly filled in with Tertiary sediments and in places by glacial material. This depression is drained towards the north by the Vistula and its tributary the San and towards the south-east by the Dniester and its affluents. The land rises gradually to the foot-hills of the Carpathian system, here known as the Beskids.

The Silesian Lowlands. The valley of the Upper Oder may be looked upon as an extension of the Germano-Polish plain. It lies between the old rocks of the Hercynian highlands (Sudetes) on the west and the Triassic rock of the Hercynian uplands (Łysogóry) on the east, and is encroached upon from both sides. It partakes of the nature of the northern lowlands in its agricultural character, though the third largest coalfield of Europe lies on its south-eastern flank, while there is considerable industrial development in the Sudetes also.

Silesia, including much of the Sudeten flank, had been under German rule since 1526, first Austrian and later Prussian, but

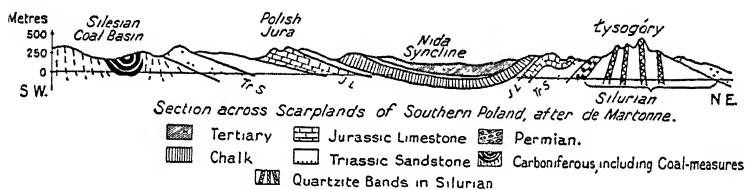


FIG. 94.—SECTION ACROSS THE SCARPLANDS OF SOUTHERN POLAND

following the advance of the Russian armies in 1945, the Poles seized the whole of Silesia, even the part inhabited by Germans. Ethnographically, the River Oder would seem to offer a reasonable boundary in Upper Silesia, but farther north German-speaking people have long inhabited both banks of the Oder.

Lower, *i.e.* northern, Silesia includes the sandy lands of the outer-most belt of the young glaciation, and is largely heath-covered, but south of the Katszbach and the Katzengebirge, on the löss, are the wide stretches of fertile loams which caused Silesia to be one of the main granaries of Germany, growing cereals, especially rye and wheat, and such crops as sugar-beet and potatoes. The old town of Breslau (Polish, Wrocław), on the Oder, is the centre of this district and the regional capital of the whole of Silesia. The fertile soil is also continued in Upper, *i.e.* southern, Silesia, but only on the west side of the Oder, especially in the löss belt at the foot of the Sudetes. East of the Oder, from the River Stober southwards, are great forests, except where the muschelkalk (Triassic) of the Chelm comes to the surface.

The Silesian coalfield indicates the near presence of the Hercynian system. It was one of the last of the great European coalfields to be developed, owing to its easterly and frontier position on the then frontier of Germany and Russia. It was developed by German capital and by German experts, but mainly with Polish manual labour.

The Upper Silesian Industrial Region. The actual productive coal-measures either outcrop or come very near the surface in the region of the great industrial conurbation of Gleiwitz-Beuthen-Königshütte-Sosnowiec. The measures sink south-eastwards until they are more than 3,250 feet below sea-level beneath the forests of Pless (Pszczyna in Polish), but rise again on the southern side of the basin and are worked near Teschen, and are believed to be workable near Cracow.

The industrial region forms a sprawling mass of "Black Country" in the heart of thinly peopled forest-land on poor, sandy, glacial soils. The industrial development of the region was based on the presence of iron-ore, originally smelted by charcoal, and the intensive development of the coalfield came rather late in the nineteenth century, after the unification of Germany. The iron-ore is now considered uneconomic to work, but the considerable supplies of lead and still more of zinc are important, Poland now being one of the few countries of Europe to possess considerable quantities of the latter mineral. The production of coal from the Polish section of the field usually exceeded 40 million tons a year, and was greater than the home market consumed, since Poland was but little industrialised. An outlet has been found in Scandinavia and in other agricultural countries which are poor in coal, such as Austria, Hungary, the Balkan countries, and Italy. To some extent Polish coal had ousted British coal from the Baltic even before 1939, since it is produced with much cheaper labour.

The main branch of manufacture is of iron and steel goods, but on the whole the higher branches of metallurgy are not represented, the industry thus showing a lack of evolution common to the youth of most industries. Iron-ore and pig-iron are imported from Sweden and England. The zinc and chemical industries make up other branches of industry, the latter partly derived from by-products of the zinc-smelting and the coke ovens, fertilisers naturally taking a high place in the output. The war-time expansion of industry by the Germans (*e.g.* synthetic rubber) has been inherited by the Poles.

The Silesian corridor is also important in regard to communications, as it gives an easy routeway to the Danubian basin.

The Sudetes. This complex region has been much fractured by faults. There are a number of small horsts between which

lie basins where the Permian and later strata have been preserved. The highest part lies in the north, where the Riesengebirge or Krkonoše Mountains ("Giant Mountains") rise above the tree limit, the Schneekoppe (Czech, Sněžka) being above 5,000 feet. The most important basin is that of Waldenburg, where coal measures are preserved, yielding about $5\frac{1}{2}$ million tons per annum. This source of power gave fresh life to the textile industries of linen and wool which had already been established. A small metallurgical industry also exists. The very sinuous frontier line between Silesia and Bohemia reflects the complex structure and topography of the Sudetes.

The Polish Jura. Overlooking the Silesian lowlands is an escarpment formed of Jurassic limestone which extends in a north-west to south-east direction from Częstochowa on the Warta to Cracow on the upper Vistula. It appears to have no recognised geographical name, though the plateau on top is sometimes known as the plateau of Wolbrom, after a small town of the same name, but the term Polish Jura may serve to indicate its character, though its similarity is to the unfolded German Jura rather than to the Franco-Swiss Jura. It formed a well-marked frontier feature for several hundred years, actually between the fourteenth century, when Silesia ceased to be Polish, and the eighteenth century, when Poland ceased to exist as a state. Numerous ruins of old castles and fortresses bear witness to the former military importance of the scarp. The top of the plateau to the east of the scarp is bleak, lacking in surface water, and has a scanty population. Currents of life are concentrated at either end, at the important cotton-manufacturing town of Częstochowa (101,000) and the old capital of Poland, Cracow.

The Nida Depression. This depression, drained southwards by the Nida tributary of the Vistula, occupies the middle of the synclinal between the two old Hercynian blocks of the Silesian coal basin and the Łysogóry. Its Cretaceous measures are covered by Tertiary sediments, and these again by glacial material, and as the latter are mainly sterile sands and gravels, or heavy clays which easily become boggy, the landscape in parts recalls the northern lowlands, with forest, heath, and marsh. Where the glacial soils have been denuded, however, the Tertiaries, which are mainly limestones, provide a good soil known as the *rendzina*, which is particularly rich in humus. The southern part of this region, together with the strip of country on the north of the Vistula from Cracow to Sandomierz, is löss-covered. Hence wheat appears in the rural economy as a change from the rye and potatoes of the glaciated northern plains.

The Łysogóry. The parallel crests of the Łysogóry follow the prevailing strike of the country from north-west to south-east and

reach over 2,000 feet in height. This old horst is a region of forests and ancient mines reminiscent of the Harz massif of Germany. Though the massif shows rounded forms in most places, the quartzite crests are often sharp and craggy.

The Depression of the San and Upper Vistula. The triangular depression between Cracow, Sandomierz, and Przemyśl becomes increasingly fertile towards the south as the coarse glacier-soils give way to the löss. It also becomes lightly dissected into hills by the San and Vistula and their affluents, but without providing any obstacle to movement, and an important railway line runs from east to west at the base of the triangle along the foot of the Beskids. Along this line a number of small market towns lie at the entrances to the mountain valleys, the town of Przemyśl being the largest.

The city of Cracow (Polish, Kraków; 299,000) lies at an important position in the gap between the Beskids and the Jurassic scarp already mentioned. Its ancient importance was largely strategic, and it was chosen as capital by the kings of Poland in the thirteenth century and kept that rank for three hundred years. Its present importance is mainly commercial, and it shows signs of playing a similar rôle in relation to the Silesian coalfield as the similar ancient city of Cologne played in regard to the Ruhr coalfield.

The Uplands East of the Vistula. The plateau of Lublin consists mainly of chalk with a considerable covering of löss. Wide treeless horizons are here the rule, and wheat, the typical cereal of the löss lands of Europe, takes the place of rye as the chief cereal, while sugar-beet is also important. Here houses are to be seen cut in the löss, as in parts of China. Lublin (116,000), an ancient town, on the old route which went along the northern margin of the löss belt, is another of Poland's isolated textile towns.

For the Polish Carpathians, *see* Chapter XXVIII.

Economic Summary. Poland was essentially an agricultural country in 1938, some three-quarters of the population being engaged in agriculture, and only one-tenth in industry. With the acquisition of the whole of the Silesian coalfield in 1945, the whole situation is changing rapidly. About half of the total area is arable, a percentage exceeded only in Denmark and Hungary. The leading and most widely cultivated crops are rye, potatoes, and hay; sugar-beet is also important, especially in Poznań and the löss uplands. Forests cover one-fifth of the total area of the country, but though Poland is one of the richest countries of Europe in this respect, the figure given includes a fair amount of poorly-timbered land, and the value of the forests should not be exaggerated.

Mining is confined mainly to the southern part of the country, the chief minerals being coal, zinc, oil, and salt. The output from

the Polish section of the Upper Silesian coalfield was 36 million tons in 1937; the total field produced about 70 million tons in 1947, and the amount is rising. The output of zinc from the same area and from the Łysogóry amounted to 131,000 tons in 1931 and 107,000 tons in 1937. The oil-wells of the Galician foot-hills appear to be approaching exhaustion, and only 502,000 tons of petroleum were produced in 1937; part of the field has been lost to the U.S.S.R., and the total annual output is now only about 250,000 tons. Of the other minerals, salt is the most important, and is mined in the Carpathian Foreland, and also in the north of Poland, to the south of Toruń.

Industrial development is concerned primarily with textiles and metallurgy. Poland, however, held only ninth place in Europe in respect to cotton spindles installed, though this is her leading textile. The metallurgical industry is handicapped by the shortage of iron-ore, only 776,000 tons being mined in 1937, and the output of pig-iron was small. As regards steel manufacture, however, with the aid of imported pig-iron, Poland stood in the same category as such countries as Italy and Sweden, the output being nearly one and a half million tons in 1937. Other considerable branches of industry are connected with the timber, sugar-beet, and oil resources, while the chemical industry is of growing importance.

As regards exports, raw materials and semi-manufactured goods accounted for half the total value, with coal and timber competing for first place, and animal products (meat and eggs) and cereals following. Textiles were the most important of the manufactured goods exported. The imports were mainly manufactured goods with the exception of raw materials for the textile industry and "colonial" produce.

REFERENCES

Polish Countrysides, by Louise A. Boyd (New York, 1937), contains some five hundred photographs covering every aspect of country life. See also *Poland*, by R. H. Kinvig (Birmingham, 1936), *Polish Studies*, edited A. Davies (London, 1934), and "La Pologne," by P. Camena d'Almeida (*Ann. de Géogr.*, Vol. 32, 1923). *Handbuch von Polen*, by E. Wunderlich (2nd edn., Berlin, 1918), deals at length with the physical geography of "Congress" Poland, "Le Partage de la Haute Silésie," by P. Dumas (*Ann. de Géogr.*, Vol. 31, 1922) contains excellent diagrams. On the new political limits, see W. G. East *The Political Divisions of Europe*, with maps (Birkbeck College, London, 1948)

CHAPTER XXII

CZECHOSLOVAKIA

ALTHOUGH Czechoslovakia is not very large, its total area of 49,000 square miles being about the same as that of England without Wales, yet its key position in Central Europe, its natural endowment, and the energy of its inhabitants make it one of the most noteworthy of the smaller countries of Europe.

The Republic was formed in 1918, when a National Council of Czechs and Slovaks took over the government of certain lands which had been formerly included in the Austro-Hungarian Empire. These lands comprised, first, the old historic Czech Kingdom of Bohemia-Moravia; secondly, the small adjacent region of Austrian Silesia which had been administered from Vienna for several hundred years; and thirdly, the relatively backward lands of Slovakia and Ruthenia which had formed part of the Hungarian Empire since its inception. The bond of Union between Czechs and Slovaks was primarily their common Slavonic language, there being less difference between Czech and Slovak than there is between "standard" English and the English of Robert Burns.¹ A second powerful bond was their passionate desire for release from the oppression which had characterised Austrian and Hungarian rule. This oppression fell more heavily on the Czechs than on the Slovaks, for the Bohemian Kingdom, including Moravia, had already had a long and distinguished history before it misguidedly chose an Austrian Habsburg as its king. Its "Golden Age" was as early as the fourteenth century, when the Bohemian king, Charles IV (a Lorrainer), became Holy Roman Emperor, and Bohemia ranked among the most cultured states of Europe. The earliest University of the Empire was that of Prague, founded by Charles IV in 1348.

The election of a Habsburg to the throne of Bohemia in the sixteenth century marked the beginning of the policy of Germanisation, which gained in intensity when the Protestant reformer Jan Hus became identified with the cause of Czech nationalism. After the disastrous defeat of the Czechs at the Battle of White Mountain, just outside Prague, in 1620, the Czech leaders were executed and

¹ Of the three main "founders" of Czechoslovakia, Masaryk was born in Moravia, Beneš in Bohemia, and Štefánik in Slovakia.

their estates confiscated. From that time onwards every effort was made to prevent the Czechs from acquiring either wealth or influence. The use of the Czech language was forbidden for all official purposes, no university education could be obtained in Czech, Czechs were not allowed to occupy any responsible administrative positions, in many cases not even subordinate positions.

For 200 years it seemed that Bohemian nationalism would never raise its head again, but signs of life were discernible in the nineteenth century with the revival of interest in the Czech language and literature. The Czechs also made strenuous efforts to raise themselves from the status of illiterate peasants and so justify their claim to self-government. The rise of industrialism and the introduction of modern methods of farming brought an increase of wealth and power to the Czechs, but the justice of their claim to independence was not acknowledged until October, 1918, when the Austrian Emperor Charles offered them federal freedom, an offer which unfortunately came too late.

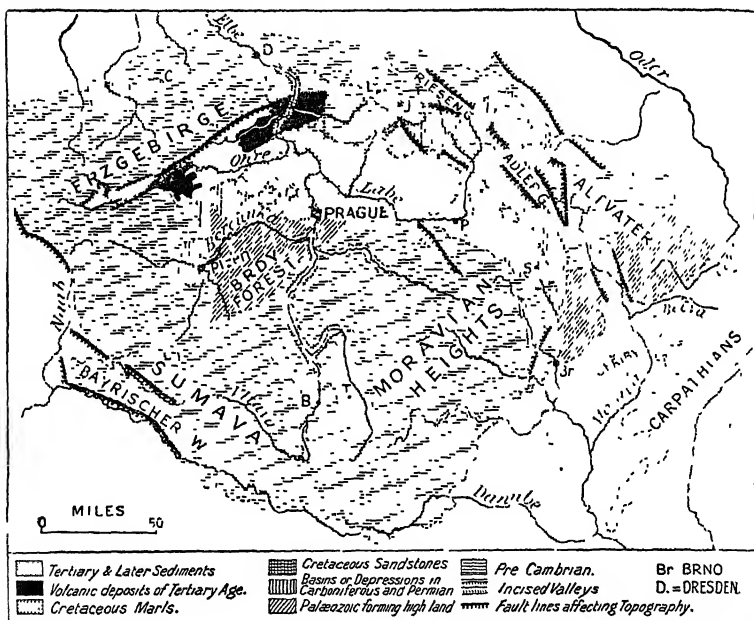
Czechoslovakia was broken up in 1938-39 to satisfy Germany's military rather than nationalist ambitions. Bohemia projected as a salient into the German lands, and no doubt was potentially dangerous to the fulfilment of Germany's revived ambition to dominate Central Europe. The minorities question was used mainly as an excuse, for it is clear that the 3 million German minority received much better treatment than the 10 million Czechs had formerly obtained under German (Austrian) rule. Unfortunately, the world slump fell more heavily on the German, *i.e.* the manufacturing districts, than on the purely Czech areas, and thus favourable ground existed for anti-Czech propaganda. The expulsion of the Sudeten-Deutsch followed the allied victory of 1945.

It cannot be said that the Czechs and Slovaks have yet reconciled their differences, while as regards external affairs the nation seems uncertain how to reconcile its traditional leaning towards the west with its linguistic and sentimental associations with other Slavonic-speaking peoples. Although the country owed its establishment in 1918 mainly to the British, French, and American allies, yet the Munich Agreement went far to undermine western influence. With the loss of Ruthenia to the U.S.S.R., Czechoslovakia is now a direct neighbour of that powerful State, and one of its satellite countries.¹

Bohemia. Bohemia, the western section of Czechoslovakia, is a rather complex piece of Hercynian Europe. It is true that the whole area may be looked upon as a rectangular-shaped horst, with corners pointing north, east, south, and west, but it is a horst containing

¹ Since the above was written, a *coup d'état* has placed Czechoslovakia still more firmly under Russian influence.

many minor horsts and basins and it is largely covered in the northerly parts with Mesozoic and Tertiary deposits. The region consists essentially of the peneplanated stumps of a folded mountain system of Carboniferous age, with traces of earlier folding. The whole region was mainly submerged during Cretaceous times, though from the marly and sandy character of these deposits it is evident that they must have been deposited in a shallow sea near land. The present horst was raised up bodily as a consequence of the earth movements connected with the building of the Alps and Carpathians, but was considerably warped as well as faulted in the



After Machatschek and de Martonne

FIG. 95.—MORPHOLOGICAL DIAGRAM OF BOHEMIA AND MORAVIA.

process. The main upwarplings took place in two regions, namely, along the south-eastern border, forming the broad swelling of the Moravian Heights, which reach only 2,739 feet, and along the south-western border in the Bohemian Forest (Cz., Šumava), which reaches nearly 5,000 feet. The main faulting took place along three lines of weakness, namely, along the outer or western side of the Šumava, along the southern or inner side of the Erzgebirge (Cz., Krusné Hory), which border Bohemia on the north-west, and on the north-east side in the Riesengebirge (Cz., Krkonoše) and Sudetes, where a complicated system of blocks and depressions arose (*see* p. 306).

Volcanic outpourings of Tertiary age sometimes accompanied the dislocations, especially in the north-west. It resulted from these warpings and faultings that the middle of the horst became a basin, in whose lower northerly part the Cretaceous and Tertiary cover was preserved. The Tertiary sediments still remain at the foot of the Erzgebirge in the Karlsbad-Teplitz depression, which is partially filled in by Tertiary volcanic deposits and thereby divided into a number of basins, and the Mesozoic deposits remain in the plain of the Elbe (Cz., Labe). The rest of the Bohemian basin consists mainly of a featureless plateau of crystalline rocks, mainly granites and ancient crystalline schists, but, quite exceptionally, the Brdy Forest south of the River Berounka (Ger., Beraun) shows little changed Pre-Cambrian and Palæozoic rocks outcropping from north-east to south-west, with the hard quartzites standing up as ridges. The basin of Plzeň (Ger., Pilsen), on the Berounka, and the Kladno basin are excavated in Carboniferous rock. The two depressions of Budějovice (Ger., Budweiss) and Třeboň (Ger., Wittingau) in the south of the crystalline plateau are filled by Tertiary deposits.

The river system reveals the general slope of the land, the main river, the Vltava (Ger., Moldau), forming a diagonal from the southern to the northern corner, where it cuts through the surrounding mountains (*see* p. 292).

Climatically the bordering mountains are areas of heavy rainfall and raw climate, but the northern plain, by its position and relatively low relief (*c.* 700 feet), has little rain and high summer temperatures, though with somewhat severe winters, *e.g.* Prague: January, 29·7° F.; July, 66·2° F.; mean annual rainfall, 19 inches. The Labe plains have almost a steppe climate, with löss deposits and patches of Black Earth (*chernozem*), and appear to have been forest-free for long ages. The southern plateau also has little rain, but summer temperatures are not so high.

NATURAL REGIONS OF BOHEMIA

A. The Mountain Border. On two sides the mountainous frontiers of Bohemia are co-extensive with part of the German frontier and their nature has already been described in Chapter XX, the third side adjoining Silesia, Polish since 1945. Each of these sides is about 200 miles long, and the greatest heights are found in the Šumava in the south-west and the Krkonoše (Ger., Riesengebirge) in the north-east, the former reaching a height of over 4,000 feet and the latter over 5,000 feet, though the crests have the usual rounded forms common to the mountains of the Hercynian

system. The Šumava on the south-west is the most densely forested and most scantily peopled of all the bordering mountains, forestry being the principal occupation. The Erzgebirge have been largely cleared and are under cultivation for hardy crops, and home industries, *e.g.* gloves, chair-making, are carried on to a considerable extent. Jáchymov (Joachimstal) is noted for its radium mines. Throughout the mountainous border the people were almost entirely German-speaking¹ until the expulsions of 1945 onwards, and were descended from settlers who penetrated the



[Courtesy Czechoslovak Legation

FIG. 96.—LIGNITE WORKINGS NEAR MOST (BRUX) IN NORTHERN BOHEMIA.

The lignite occurs near the surface and the mines are open to the sky.

Slavonic-speaking salient of Bohemia in the Middle Ages. In places they also penetrated into the basins at the foot of the mountains.

B. The Northern Plains and Basins. (i) *The Tertiary Depressions of Karlsbad and Teplitz.* These lie at the faulted foot of the Erzgebirge and consist of a number of basins separated by massifs of considerable height. The basins are particularly notable in having preserved large quantities of Tertiary lignite. In the west is the little basin of Cheb (Eger), which, however, has no workable lignites and lies at a height of some 1,300 feet and is mainly devoted to pasture. East of this is the basin of Falknov-Karlovy Vary, (Falkenau-Karlsbad), both towns lying on the Ohře River (Eger).

¹ The German versions of place-names are historic, and are the only ones given in some Atlases.

This basin possesses considerable and varied resources, namely, lignite, mineral springs, which have made the fortunes of Mariánské Lázně (Marienbad) and Karlsbad, and kaolin from the neighbouring granitic Kaiserwald for the Karlsbad porcelain industry. East of this basin is the volcanic massif of Doupov, reaching a height of 3,000 feet, but on the far side lies the löss-covered Teplice basin (Teplitz; 45,000)¹ which is some forty miles long and of great agricultural richness, as well as containing the largest deposits of lignite in the country, some 15 million tons being mined annually. A flourishing glass industry is found here, and machinery of various kinds is also manufactured. The volcanic plateau of the Bohemian Mittelgebirge (Cz., Středohoří) succeeds this basin eastwards, but its fertile basalts render it suitable to cultivation up to a height of nearly 2,000 feet, and its lower slopes carry orchards, hops, and wheat. The River Labe crosses the plateau in a well-incised valley. Usti (Aussig), with suburbs about 70,000, is a river port and manufactures chemicals.

The Tertiary depression was colonised by Germans from the Erzgebirge in the Middle Ages, but increasing numbers of Czechs settled there, especially in the Teplitz basin, when the development of the mines called for an increase of labour.

(ii) *Basins and Plateaus at the Foot of the Riesengebirge.* At the foot of the Riesengebirge lies a depression separated from the Labe plain by plateaus of hard Cretaceous sandstone. Here a considerable textile industry, mainly cotton, has developed from an old domestic linen industry using locally grown flax. Liberec (Reichenberg), which with its suburbs numbers about 72,000 people, is the centre of the scattered industry. Jablonec (Gablonz) is the centre of the most original aspect of the Bohemian glass industry and manufactures beads and imitation jewellery of all kinds. The population of this region was also mainly German-speaking, of whom a few key-workers were allowed to stay, especially in connection with the glass industry, as their skill and experience were irreplaceable.

(iii) *The Labe Plain.* This is the only large plain of Bohemia and stretches from south-east to north-west for a distance of sixty miles, beginning near Svitavy (Zwittau) to beyond the junction of the Labe and Vltava. It is some twenty miles broad, lies mainly below 700 feet in height, and is of exceptional fertility, its Cretaceous marls being mainly covered with löss on which *chernozem* soils had developed. Farming is on modern lines, including such commodities as sugar-beet and forage crops, as well as wheat and other cereals, while stall-fed cattle and pigs are also important. The population is

¹ Population figures are estimates for 1947.

Czech-speaking and is fairly dense, but there are few towns of any size, the nearness of Prague discouraging the growth of other urban centres.

The Cretaceous cover extends to the neighbourhood of Prague, and undoubtedly at one time extended farther south.

C. The Bohemian Plateau. Unlike the northern lowlands of Bohemia, which are a region of rich and varied agriculture as well as considerable industrial development, the uplands of southern Bohemia are regions of poor agriculture, only redeemed by the



[Courtesy Czechoslovak Legation]

FIG. 97.—ORCHARDS AND PLOUGH-LANDS IN THE NORTHERN LOWLANDS OF BOHEMIA.

The view is taken south of the Středo Hoří between Třeбенice and Libochovice. The two isolated hills are of volcanic origin.

presence of a few richer basins and by the coal basins of Plzeň and Kladno.

(i) *The Basins of Plzeň and Kladno.* The former was excavated by the Berounka and its numerous tributaries in the rather soft Carboniferous sandstones and shales, and forms a little region of rich agriculture, whose barley and hops were the original basis of the brewing industry, which attains vast proportions. Plzeň (118,000) also possesses large metallurgical works (Skoda) in addition to its breweries, and was the great Austrian manufacturing centre of armaments, the iron-ore originally coming from the Brdy Forest to the south. The Plzeň coalfield, however, is now nearly exhausted,

but the Kladno field, some twenty miles west of Prague, has an output of about 2 million tons per annum.

(ii) *The Brdy Forest* still retains considerable forest cover (50 per cent.).

(iii) *The Crystalline Plateaus* are regions of undulating relief, varying in height from 700 to 2,700 feet. The rejuvenation of the drainage has caused the larger rivers to incise their beds, but the upper courses and smaller streams still show senile features and are often marshy (cf. Plateau de Haut Limousin in the Massif Central of France). The plateau is generally a region of rather poor soils, and potatoes and rye are the dominating crops.

(iv) *The Tertiary Basins of Budějovice and Třeboň*. The latter, at a height of more than 1,400 feet, is little below the level of the surrounding plateau, while the former, at a little over 1,100 feet, is considerably below. The Tertiary clays, though apt to be marshy and still covered with many lakes, are generally fertile. The lakes or "ponds" are famous for carp rearing, and they are regularly drained for their "crop" of fish to be harvested. Budějovice (38,000) has a well-known industry in the making of lead pencils, the graphite being obtained from Krumlov south of the basin. In this southern corner of the Bohemian horst the central plateau is not bounded by any definite heights, and communication is not difficult with the Danube valley.

Prague (Cz., Praha; 921,000). The capital city is situated on the Vltava on the southern border of the northern lowlands, almost in the middle of the Bohemian "diamond." Its name is said to mean "threshold," from the banks of quartzite which outcrop in the river bed having produced fordable shallows, though at the same time they set a limit to navigation. The city is placed at an admirable nodal point and it was of considerable fame in the Middle Ages, but remained small until the middle of the nineteenth century, when industrialisation began to make itself felt in the country. The city itself has important manufactures, using the pig-iron made on the Kladno coalfield for all kinds of metallurgy, including locomotives, machinery of all kinds, agricultural implements, etc. The alimentary industries are well represented, and the products of the neighbouring Labe plain are manufactured as well as imported raw materials. The textile, glove, and glass industries are also of considerable dimensions. The choice of Prague as capital for Czechoslovakia added to the importance and population of the city, which is the commercial and intellectual centre of the country.

Moravia and Silesia. Moravia, which comprises the greater part of the basin of the Morava, stretches from the Moravian Heights of the Bohemian horst on the west to the Carpathian zone on the east,

and includes the lowlands of Tertiary and later sediments between the two. The former province of Austrian Silesia, with its coalfield, was also handed over to Czechoslovakia, with the exception of a small piece in the north-east near Teschen (Cz., Těšín), which went to Poland.

The Moravian lowlands are rich lands from an agricultural point of view, but are perhaps better known to the world at large on account of their importance in affording one of the main highways of movement in Europe. By linking the lowlands of Silesia with those of the Vienna basin they afford the easiest line of movement between the great Germano-Polish plains and the great plains of

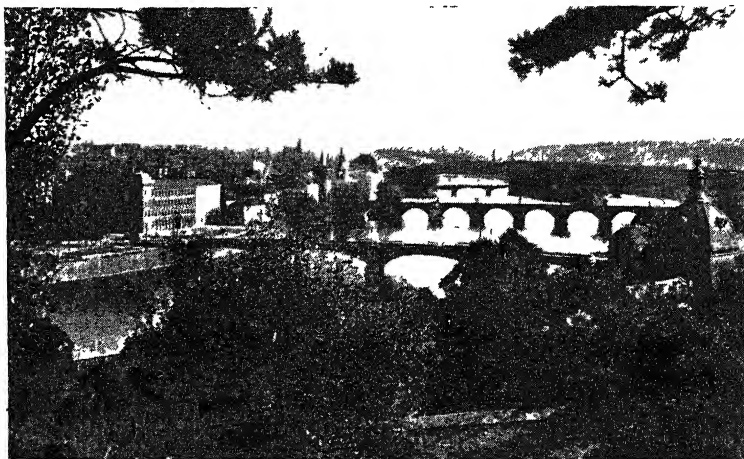


FIG. 98.—PRAGUE AND THE RIVER VLTAVA.

View looking south from the Hradčany, the hill crowned with castle and cathedral on the west bank of the river. Note the river terraces and the level skyline.

the middle Danube, and so form part of the route which links the Baltic to the Mediterranean. The actual "Moravian Gate" lies at the north-eastern end of the lowlands, and it is a narrow depression, only a few miles wide, closely approached by the Carpathians on the east and by the Sudetes on the west. It forms a low water-parting, just over 1,000 feet in height, between the head-waters of the Oder and those of the Bečva, a tributary of the Morava, or, in other words, between the Baltic and Black Sea drainage areas.

The north-western border of Moravia is formed by the Moravian Heights, which sink down gradually towards the south-east. As already mentioned, these are part of the Bohemian horst, and their

gently rounded forms indicate an upraised peneplain. In the western part, centred on Jihlava (Ger., Iglau; 23,000), the granitic uplands attain considerable heights (between 2,000 and 3,000 feet), and the region is mainly one of poor agriculture and rather scanty population. Farther east there is a north to south depression, presumably a down-warping of the crystalline horst, which has been partially filled by sedimentary deposits, largely of Cretaceous age. In these fairly easily eroded marls and sandstones the rivers have cut deep valleys and in particular the Svitava offers a line of movement below 1,500 feet which is followed by the railway between Prague and Brno, though the main line between Prague and Vienna goes over



FIG. 99.—VIEW IN THE MORAVIAN HEIGHTS.

The village is Olešnice, about 25 miles north-north-west of Brno.

the granitic heights farther west *via* Jihlava. East of the Svitava depression the horst rises again, but is practically cut off from the Sudetes by the north-western extension of the Moravian lowlands along the upper Morava.

The Moravian lowlands themselves are divided into three main sections by "islands" of higher and less fertile land, namely, the Ždanský les (Ger., Steinitzer Wald) and the Chřiby (Ger., Mars Gebirge) and the Pavlovské Hills. These uplands run in a north-east to south-west direction and are outlying portions of the Carpathian system, partially submerged by later sediments. To the east of them, below Hradiště on the Morava, the lowland is less fertile than usual, and the Morava itself is bordered by marshes,

which account to some extent for the old frontier with Hungary following the line of the river. To the north-west lies the fertile country of the upper Morava, surrounding Olomouc (57,000) and Přerov (about 22,000), and to the west lie the fertile lowlands in front (*i.e.* east) of Brno (Ger., Brünn).

Agriculture is the dominating interest of these lowlands and crops are rich and varied. Sugar-beet, barley, vines, wheat, maize, rye, and forage crops, cattle and pig-rearing are all important. Manufacturing industries are to a considerable extent concentrated at Brno (273,000), the only really large city of Moravia. Textile industries predominate, though the sheep which formerly supplied the raw material have now disappeared from the granitic Moravian Heights in favour of cattle. The city is situated at the meeting-place of the route from Prague across the Moravian Heights with the route north-eastwards along the plain to Silesia.

The proximity of the Silesian coal basin is encouraging the growth of factories in Moravia (*e.g.* the Bat'a shoe factory at Zlin, 40 miles east of Brno), but the heavy industries (coke, metallurgy) naturally remain on the coalfield itself, which produces more than three-quarters of the total coal output of the country. The two Ostravas (Moravian and Silesian), Vitkovice and Mariánské Hory together form an industrial conurbation numbering more than 200,000 people.

Economic Summary. The sections of Czechoslovakia described above concentrate the chief commercial activities of the country, and are the main contributors to international trade. Slovakia (*see* Chapter XXVIII), owing to its more easterly position, its mountainous character, and its long subjection to Budapest, is much less well-developed. In fact, one of the major lines of cleavage between western and eastern Europe runs through the middle of Czechoslovakia. To the west, especially in Bohemia and Silesia, both industry and agriculture are highly organised and run on modern lines, even the crops being mainly "industrial," such as potatoes for distillation, sugar-beet for the sugar industry, barley and hops for the brewing industry. Less than 30 per cent. of the population of Bohemia is engaged in agriculture. Industry works largely for the export market; Bohemian glass, engineering products, and textiles being well-known abroad. Towns are of considerable size, population attains a high density, and the network of communications is adequate. Moravia is less developed industrially, but the full contrast is seen in Slovakia, where life goes to a different pattern and tempo than in Bohemia. Traditional methods of peasant subsistence farming are still prevalent, the picturesque local costumes still tend to be spun, woven, and hand-made at home, towns are few and small, and the transport system

was very poor until the improvements effected between 1918 and 1938. Industries are mainly limited to simple processes, and to small and scattered concerns. The standard of such things as housing, sanitation, and medical services is lower than farther west, and although the population density is lower, both the birth and death rates are higher. Slovakia's main export may be said to be the human beings who emigrated in large numbers.

Taken as a whole, Czechoslovakia is self-sufficing in timber, most agricultural products, coal and iron-ore. The output of lignite averages about 15 million tons per annum, and that of bituminous coal about 13 million tons. Petroleum, various mineral ores and small quantities of specialised chemical products are normally imported. The manufactures cover the requirements of the home market, leaving a surplus for export. Raw cotton, fine wool, and "colonial" produce must necessarily be imported.

The nationalisation of the banks and the major industries, which took place after 1945, was not mere imitation of the U.S.S.R., but resulted partly from the fact that many of the industries have been in the hands of "Sudeten" Germans who were transferred to the Reich at the cessation of the German occupation, and partly owing to the Germanising of all industry between 1938 and 1945.

REFERENCES

J. Moscheles' "Natural Regions of Czechoslovakia" (*Geogr. Rev.*, Vol. 14, 1924) *Landeskunde der Sudeten und West-Karpatenländer*, by F. Machatschek (Stuttgart, 1927). *The Eastern Marchlands of Europe*, by H. G. Wanklyn (London, 1941), and "The Middle People," by H. G. Steers (*Geog. Journal*, 1948). The superb *Atlas de la République tchéco-slovaque* (Prague, 1937), with text, offers a firm practical foundation for the study of the Czechoslovak lands. It is also published as the *Atlas of the Czechoslovak Republic* (*Atlas republiky Československé* (Prague, 1936), with explanatory text in English and French.

See also *Czechoslovakia*, by H. G. Wanklyn (Mrs. J. A. Steers) (London, 1954)

CHAPTER XXIII

THE ALPINE REGION

GENERAL INTRODUCTION

THE Alpine arc is some 520 miles long and varies in width from 80 to 140 miles. It contains hundreds of peaks above 10,000 feet high and, in spite of the comparatively low latitude (from about 43° to 48° N.), it carries the greatest glaciers of the mainland of Europe. The greatest average height and the greatest number of high peaks are to be found in the central portion where the range is narrowest, particularly in Switzerland and the adjacent French Savoy, where Mt. Blanc is 15,681 feet in height, while many peaks in the Zermatt and Bernese chains in Switzerland are between 13,000 and 15,000 feet, *e.g.* the Weisshorn, Dom, and Matterhorn in the former, and the Finsteraarhorn, Jungfrau, and Mönch in the latter.

Structure. It is now generally accepted that the Alps are for the most part built up of a number of *nappes* piled one on top of the other. (See Chapter I.) It is considered from the *facies* of the rocks, *i.e.* their lithological character and their fossils, that the material forming the *nappes* was derived from sediments deposited in a great geosyncline occupied by an ancient sea. The upper sediments deposited during Mesozoic times seem to have undergone little metamorphism and now form mainly limestones—believed to have originated in both the northern and southern parts of the sea—or else slates and shales (Fr., *schistes lustrés*; Ger., *Bündnerschiefer*), believed to have originated in the central part of the sea. The older and more deep-seated rocks of Palæozoic age underwent pronounced metamorphism, presumably owing to great pressure, and became very crystalline, but together with much intrusive granite they all became involved in the vast system of earth waves raised by the violence of the earth storm of mid-Tertiary times. Consequently each *nappe* consists, or consisted originally before denudation set to work, of an inner core of metamorphic crystalline rock and an outer hull or envelope of little changed sedimentary rocks, though the actual *facies* varies very much from place to place according to the particular position occupied originally in the geosyncline. Some geologists consider that certain bulges or geanticlines took place in the geosyncline before the end of Palæozoic

times, that islands were formed from whose surface rock material was denuded and deposited in the surrounding sea, and that some of the differences in *facies* can be thus explained.

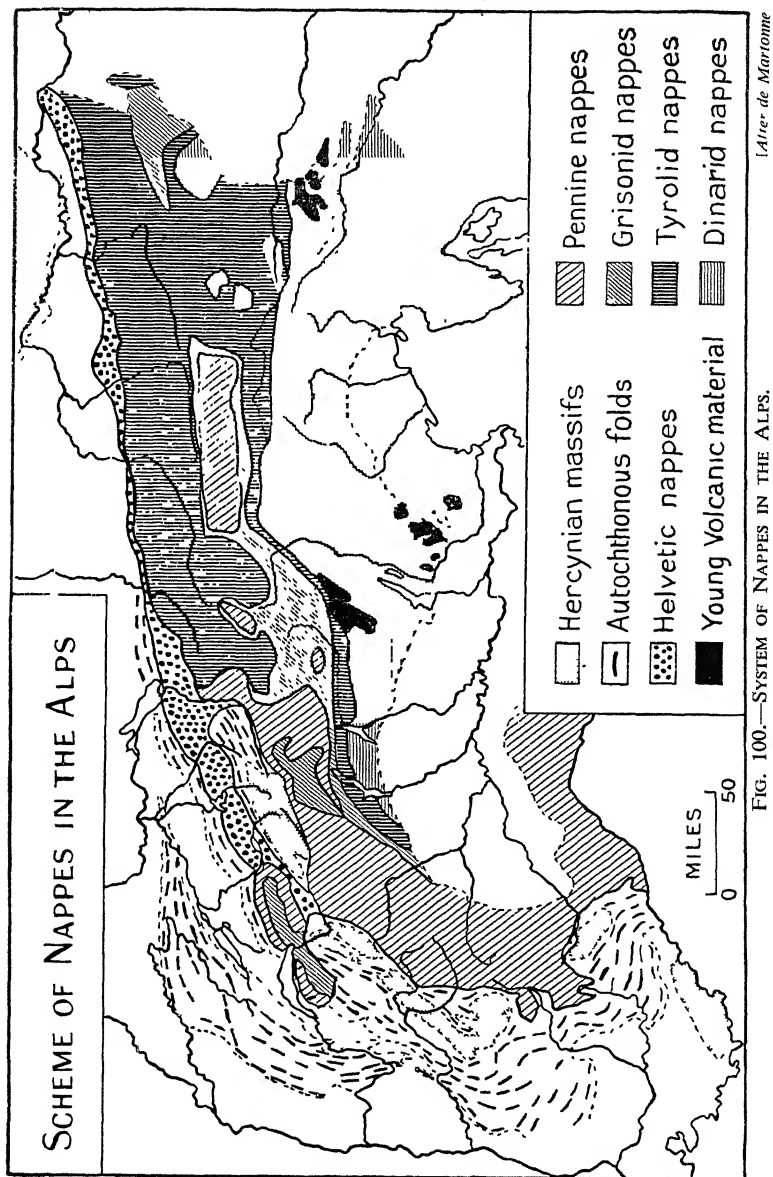


FIG. 100.—SYSTEM OF NAPPES IN THE ALPS.

The main *nappes* recognised are four in number, the Helvetic being the lowest in position, followed by the Pennine, Grisonid, and Tirolid, the two latter together often being called the Austrides. A fourth division, the Dinarid, though it has overridden the Tirolides in places, in general represents an earth wave that toppled backwards, as it were, and its strata are recumbent towards the south. A vast amount of denudation has taken place in the lofty Alpine chain and in places entire *nappes* have been removed, so that it is only conjectured that the Tirolid *nappe* was once present in the western Alps, west of the Vorder Rhein, where, indeed, denudation has advanced so far that old Hercynian massifs have been partially exposed to the light of day. Such are from south to north the Mercantour, Pelvoux, Mt. Blanc, and Aar massifs, which are composed principally of hard crystalline rock such as granite and gneiss. It is considered that in parts of the western Alps erosion has removed deposits nine miles thick, though this does not imply that the Alps were once nine miles higher. In the eastern Alps, on the contrary, denudation has proceeded less far, apparently because there the *nappes* were piled less high, and this in turn may have been due to the underlying Hercynian floor being generally lower than in the west. It must be remembered, however, that the Hercynian massifs themselves were raised bodily by the earth storm.

In consequence of their less exposure to denudation, owing to their lower height, the eastern Alps generally retain the Tirolid *nappe*, though erosion has laid bare the underlying Grisonid and Pennine *nappes* in the Hohe Tauern and Upper Engadine region. The exposure of these inliers may be due to the presence, relatively near the surface, of ancient Hercynian massifs, which have arched up the *nappes*, but this is only conjectural. The southern part of the eastern Alps belongs to the Dinarides, which are not represented in the western Alps, but probably are sunk beneath the alluvial deposits of the North Italian plain. From the geological point of view there is thus a fundamental distinction between the eastern and western Alps, the dividing line roughly joining Lake Zürich and Lake Como.

It must not be supposed, however, that the *nappes* are merely simple slabs of the earth's surface. In their movements in regard to each other they themselves developed every kind of overfold and sheared recumbent fold, so that having been acted upon by erosion one outcrop succeeds another in bewildering complexity. Only by the most detailed studies of the lithological and palæontological nature of the outcrops could an elucidation of the structure be reached, and the converse is true, so that it is not possible to

deduce anything in detail about the relief or character of the outcrop from broad generalisations about the structure.

Indeed, one of the facts that emerges from a study of the Alps is the small amount of relation that their structure bears to relief. Only in the autochthonous outer folds of the French Alps is it possible to trace the relations between the folds and the present mountains and valleys. The arcuate shape of the Alps and the parallelism of the chains and longitudinal depressions are features common to most of the young folded mountain areas of the world, and the longitudinal valleys of the Alps do, to some extent, correspond to lines of contact between the different *nappes* (as in the case of the Rhône valley above Martigny, the Inn valley below Innsbruck, and parts of the Salzach and Enns valleys), or to root zones, but the depressions show a disconcerting habit of passing from one zone to another. No one can say, moreover, why the transverse valleys, even the most important ones, such as the Adige and Reuss, are situated where they are. The relief, however, is related to the lithological character of the outcrop to some extent, and also to the later geological history of the region in late Tertiary and in Quaternary times.

Quaternary Rejuvenation and Glaciation. After the great paroxysm of folding which culminated in Miocene times, denudation reduced even the mighty Alps to a low range with mature rounded forms; in certain parts, indeed, peneplain features were copiously produced, particularly in the eastern Alps. The sea invaded the Vienna basin and the basins of Klagenfurt and Laibach (Ljubljana) in the east of the chain, and the Durance basin in the west. The Alps were saved as a mountain system only by a great new movement of re-elevation, but this time a vertical (epeirogenic) movement *en masse*, which was inaugurated at the close of Tertiary times and was largely responsible for the present great height.

This movement had already led to the rejuvenation of the river system and to an increased rate of erosion before the onset of the Ice Age, which was destined to modify profoundly the entire relief of the Alps. The whole of the Alps was covered by a great ice-sheet, with the exception of the south-eastern and south-western extremities, mainly in Styria, parts of Carinthia, and Provence. Only the higher peaks stood up above the level of the ice in a manner similar to the *nunataks* of Greenland at the present day. The Ice Age, which was spread over a long period of time and here included four periods of glaciation with three warmer and drier interglacial periods, produced many and various results. To the Ice Age must be attributed the sharp outlines to be found in the High Alps and the frequency of the horn or pyramid-shaped peaks, which were

exposed to the fierce denudation of frost and ice as they stood above the snowfields. The valleys, also, which had begun to be incised owing to the epeirogenic movement, were filled with glaciers, whose pressure as they moved along scooped out the pre-existing main valleys and over-deepened them, leaving the typical flat-bottomed, steep-sided valleys known as "U-shaped," *e.g.* Lauterbrunnen, Upper Rhône, Vorder Rhein, and hundreds of others. The sides of the mountains beneath the peaks and above the main valleys were covered, on the other hand, with almost inert ice and were protected from both types of erosion, so that a shelf of gently rounded forms



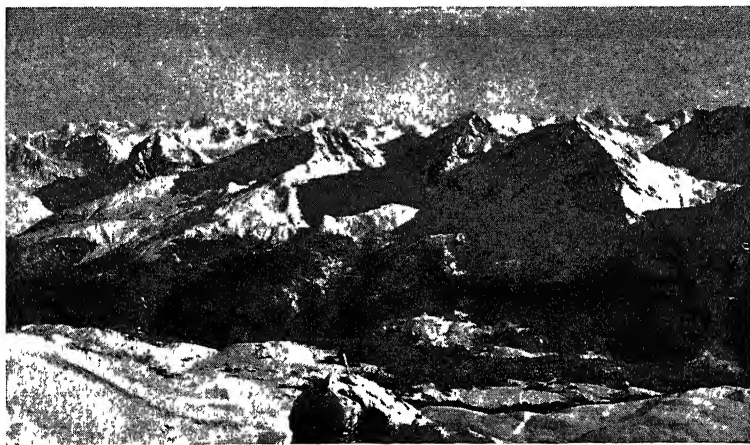
FIG. 101.—THE LAUTERBRUNNEN VALLEY, BERNESE ALPS.

A typical U-shaped valley, with lateral shelves. The waterfall on the right (the Staubbach) descends 980 feet vertically from a "hanging valley."

is usually to be found in this position, and the streams often tumble down from these shelves to the main valley by means of waterfalls. In the eastern Alps, especially on the outer borders where the mountains are lower, the higher parts more rarely rose above the snowfields and there are fewer sharply pointed peaks; on the contrary, the old peneplain surface can often be recognised at the top of steep-sided "towers" or "blocks," as in the Steinernes Meer south of the Königsee near Salzburg. Space forbids more than a brief mention of the Alpine cirques, the irregular profiles of the main valleys, and the numbers of small lakes, for whose origin the reader is referred to works on physical geography. The presence of the great lakes

on the borders of the mountains is a distinctive feature of the Alps alone among the young folded mountains of Europe, though similarly placed lakes are found in the Scandinavian highlands. Here in the Alps they usually occupy over-deepened U-shaped valleys and tongue basins, which are often blocked at the outward end by accumulations of morainic material.

Lithological Material. The description of the main lithological zones of the Alps has been postponed until this point in the chapter in order to make clear that the present landforms are due more to



[Photo: C. W. Johnstone]

FIG. 102.—VIEW TAKEN IN WINTER OVER THE AROSA VALLEY, CANTON GRISONS

The range here shown, which separates Arosa and Davos, is a very minor one for the Alps, but exhibits the characteristic pyramid-shaped peaks, and the gently sloping lateral shelf above the steep-sided main valley. The shelf on the far side of the valley is forested, mainly owing to its unfavourable northerly exposure, while that from which the view was taken has been cleared for cattle pasture. The vast scale of the photograph can hardly be realised unless the frozen lake in the right centre can be picked out: this lake is sufficiently large to act as a landing ground for aeroplanes, and it is surrounded by large hotels which appear in the picture as mere dots.

the processes of peneplanation, rejuvenation, and glaciation than to the character of the rocks. For instance, though the high peaks are generally to be found in the crystalline zone, they are not confined to this belt, as the limestone giants of the Bernese Oberland testify, *e.g.* Eiger, Wetterhorn, Diablerets, etc., and even relatively unconsolidated deposits can form mountains of quite dignified dimensions, as in the case of the Tertiary conglomerates of the Rigi. Similarly, areas with rounded relief are to be found on all the formations

Fig. 103 gives the main facts of the disposition of the rock zones. The interior zone, which consists mainly of highly crystalline rocks interspersed with bands of slates and shales, belongs to several *nappes*, including the Tirolid, Grisonid, and Pennine; mainly the Tirolid in the eastern Alps east of the Vorder Rhein and the Pennine in the western Alps. The old Hercynian masses also form part of this inner crystalline belt, and like the crystallines of the *nappes* are formed of highly resistant rocks, such as gneisses and granites which weather very slowly. In contrast to the crystalline rocks, which stand out as the main chains of the inner Alps, the slates and shales are much more easily eroded and the slopes are often milder than is usual for the High Alps, while excellent pastures are more than usually extensive, as in Canton Grisons (Switzerland) and the Kitzbühler Alps (Austria).

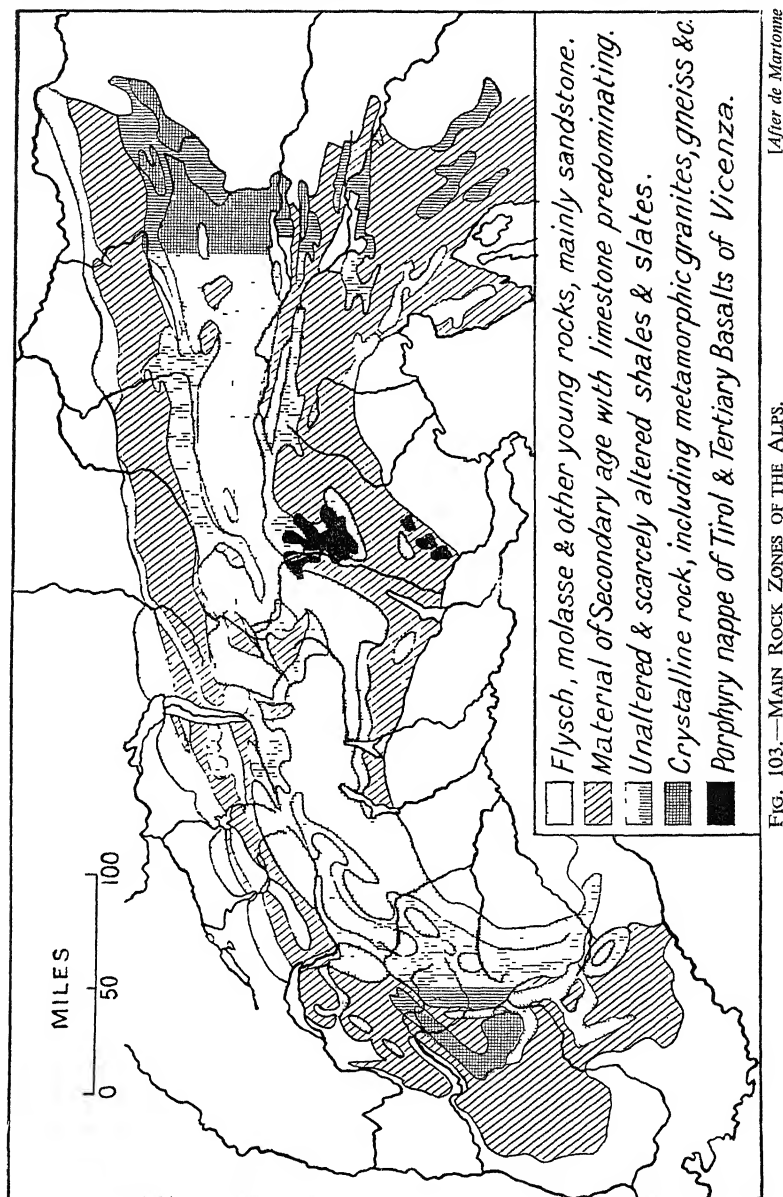
On the southern side of the crystalline zone in the eastern Alps is the southern limestone zone, belonging to the Dinarides. This thins out westwards and disappears altogether a little to the west of Lake Maggiore. Farther west the crystalline zone abuts directly on the alluvium of the North Italian plain.

A northern limestone zone lies on the northern side of the crystallines, but this is a very composite belt. In the eastern Alps of Bavaria and Austria the limestones belong to the Tirolid *nappe*; west of the River Arve in the French Alps the limestones do not belong to a *nappe* at all, and instead of being transported over long distances were folded more or less *in situ* and are therefore called autochthonous.

Climate and Vegetation. The Alps lie in two main climatic subdivisions of Europe, the greater part falling within the region of Central-European climate and the southern part, roughly south of 45° N., in the Mediterranean zone. The latter consequently is a region of summer drought, while the mass of the range has precipitation all the year round, with a maximum in summer in the northern Alps, in autumn on the Italian side.

As in all mountain chains the climate varies very much according to the height and degree of exposure to the prevailing winds and to the sun. The slopes facing north are naturally colder than those facing south, and the wide valleys, which become veritable hot-houses in summer, yet suffer from a temperature inversion in winter and are colder than the slopes above. In winter, indeed, the region above 3,000 or 3,500 feet generally has a much more pleasant climate than the lower land, as it is above the level of maximum cloudiness and usually enjoys bright, sunny days with dry, still air, whereas the valleys may be filled with a chilly mist. In summer the

cloud belt rises higher, owing to the greater warmth and consequent development of rising current of air, and the lower valleys are



sunnier than the higher regions, though the high peaks above 7,000 or 8,000 feet often rise above the clouds.

The precipitation is naturally heavier than that of the surrounding plains, but is not as high as that on much lower mountains in the Atlantic climatic region. The interior valleys in particular have a low precipitation, often less than 30 inches, especially in Switzerland and Austria, hence the need for irrigation of many of the valleys. The outer ranges of the eastern Alps have copious precipitation, often exceeding 80 inches, while the Venetian Alps deriving their rain from Mediterranean cyclones have twice that amount in places. The Alps of Savoy also have a heavy rainfall. The precipitation in winter usually falls in the form of snow, practically the whole range being snow-covered for at least three months in a normal winter, while the snow often lies for six months above about 6,000 feet. The lower limit of everlasting snow naturally varies with the latitude, with the exposure to the sun, with the amount of precipitation, as well as with altitude, and it comes down as low as 8,000 feet in the northern Swiss Alps and reaches as high as 10,500 feet in the drier central Alps. The lowest glacier (the Lower Grindelwald in the Bernese Alps) ends as low as 3,500 feet, but this is rather exceptional. All the glaciers are now in relatively rapid recession.

Owing to the great contrasts in temperature resulting from differences in altitude there are a great number of local winds. The Föhn wind is due, however, to differences of pressure between the Mediterranean basin and the plains of central Europe, and it blows when a marked cyclone is passing across Europe on the northern side of the Alps. It is usually described as a warm dry wind from the south and is a notorious "eater of snow" and so is welcome at the end of winter, but when the Föhn is roaring among the forest trees the sky is usually overcast and the rise of temperature from just below to just above freezing-point has the effect of making the atmosphere feel both damper and colder, so that in mid-winter all welcome the end of the Föhn and the return to the typical winter climate with its warm, bright sunshine and calm air, even though the temperature *in the shade* is lower.

The vegetation of the Alps is naturally closely bound up with the climate. Where the Central-European climate prevails magnificent summer pastures of grass (the true *alp*) are found beneath the snow-line. Below these comes the zone of forests, whose upper limit is about 5,900 feet, but has often been lowered by man, while its lower limit is about 2,600 feet, though again it has been largely encroached upon. The forest generally remains both on the steeper and shadier slopes, and in spite of having suffered attack both from above and below, it is still the most extensive vegetation zone of

the Alps. It is mainly composed of conifers, but includes deciduous trees near its lower margin.

In the Mediterranean Alps both grass and forests are more rarely found, and the prevailing vegetation consists of Mediterranean shrubs resistant to the summer drought. In regard to cultivated vegetation the Alps are a region principally of forage crops, used as food for dairy cattle, but in the broad longitudinal depressions, such as the valleys of the Isère and the Inn, maize is widely grown, and the vine also has a considerable place, being cultivated up to a height of about 2,600 feet on the sunny slopes. In the lower valleys of the Mediterranean Alps the olive is cultivated as well as the vine



[Photo Margaret R. Shackleton

FIG. 104.—THE UPPER GRINDELWALD GLACIER, BERNESE ALPS

and other fruits, and on the higher slopes the pasture is utilised mainly by sheep, as it is generally not sufficiently rich for cattle.

Alpine Routes. The Alps with their sunny slopes and valleys provided a more favourable home for early man than the marshes and forests of northern Europe, and were well populated and the passes known and crossed in prehistoric times. In historic times the position of the Alps between Italy and the lands farther north led to their exploration by the Romans, and to the construction of roads connecting the homeland with the provinces across the mountain chains. This directed traffic on to a few lines of movement, such as the Mont Genève, Little St. Bernard, Great St. Bernard,

and Brenner routes, which were used for centuries until the roads decayed with neglect in the Middle Ages, during which time hundreds of passes came into use again for the pack animals which transported the goods of the Mediterranean and the Orient to northern Europe. The construction of military routes by the rulers of Austria and Savoy in the eighteenth century, followed by Napoleon's military roads, of which the Simplon was the most noted, led once more to concentration on a few arteries of movement, a concentration intensified by the construction of the trans-Alpine railways, though the improvement in motor cars and the growing tourist traffic has led to the construction of a modern road-net penetrating all the main valleys and utilising a considerable number of passes.

In spite of their height and width, the Alps are a relatively open mountain range, mainly on account of their great longitudinal valleys. The transverse valleys also, such as the Ticino, Reuss, Adige, Dora Baltea, etc., provide most valuable lines of movement penetrating deeply into the mountains, but these are often obstructed by gorges, which baffled the early travellers, so that many of the apparently direct routes were not used until the late Middle Ages or early modern times. For instance, the St. Gothard route came into use in the thirteenth century following the building of a bridge across the Schöllenen Gorge which the Reuss has cut through the granites of the Aar Massif. Similarly, the direct route to the Brenner Pass by the Adige-Isarco valley was not used until the fourteenth century, owing to the obstacle of the Isarco defile through the porphyry plateau from Klausen (It., Chiusa="gorge") southwards. The Simplon was not much used until Napoleon's road was built across it.

The modern railways generally follow the most important of the old roads, partly because they utilise the same ways of approach to the main passes, and partly because the old roads selected out of the many possible routes those which afforded the shortest path between the goals of movement. It is fairly easy to cross the Alps by circuitous routes if time is no object, but good direct routes are few and far between. Most of the railway routes solve the difficulty by means of tunnels, which though difficult and costly in construction, enable the traveller to cross the western or central Alps in a little over two hours. The first of these great Alpine tunnels, the Mont Cenis, opened to traffic in 1871, is seven and a half miles long, occupied fifteen years in construction, and linked Genoa and Turin with Lyons, Paris, and ultimately London. The valleys leading up to it are the Dora Riparia on the Italian side and the Isère-Arc on the French. Farther towards the east, the next two trans-Alpine railway routes, the Simplon and the St. Gothard, both traverse

Switzerland and unite at Milan on the Italian side. The Simplon tunnel, twelve miles long, built a quarter of a century later than the Mt. Cenis, took only eight years in construction as the result of the increase in experience during that interval. On the Italian side the tunnel is approached along the Toce valley, but on the Swiss side the route debouches on the longitudinal furrow of the Upper Rhône—along which the railway continues westward to Lake Geneva and Paris—and another tunnel, the Lötschberg, had to be constructed (in 1912) in order to pierce the Bernese Alps and connect up with the Swiss plateau. The Lötschberg-Simplon line is widely used by English travellers coming from the Channel ports by the new route which traverses Champagne and avoids the *détour via* Paris. The St. Gothard route, which culminates in a tunnel nine and a quarter miles long, utilises the Ticino valley on the Italian side and the Reuss valley on the Swiss, and is the main route linking Genoa and Milan with Zürich and western Germany, and is also much used by traffic from England, Belgium, and Holland. Both the Lötschberg-Simplon and the St. Gothard routes serve much the same area and emphasise the importance of this line of movement. The St. Gothard had the initial advantage over the Lötschberg-Simplon in having only one mountain chain to cross and therefore needing only one main tunnel. The Brenner route connects the eastern part of the north Italian plain with central Germany. The approach valley of Adige-Isarco on the Italian side gives a direct south-north route for three-quarters of the way across the Alpine range, but on the northern or Austrian side the route leads down into the longitudinal valley of the Inn at Innsbruck, and further chains have to be tunnelled before the railway emerges on to the Alpine Foreland of Germany. The Brenner Pass is only 4,495 feet high and no long tunnel was necessary.

East of the Brenner the Alps are lower but broader and more complex, and routes tend to be more circuitous. Moreover, the main direction of movement, between Vienna and the head of the Adriatic, is oblique, and longitudinal valleys are considerably utilised, particularly the Mur-Mürz leading up to the Semmering Pass, but there are several other important routes, like that utilising the Klagenfurt depression to the Venetian plain.

International expresses also use the composite longitudinal depression between Lake Constance (Boden See) and Vienna, following the Inn, Salzach, Enns, and other valleys, though the trains are slow judged by English standards. Mountain railways are plentiful, especially in Switzerland, and carry tourists high up the mountains.

The main advantage which the railways possess over the roads in the Alps, at least, for trans-Alpine travel, is their greater freedom from obstruction by snow, so that the main lines and even most of the branch mountain lines are open all the year round, whereas the roads are apt to become impassable in winter; in fact, very few of the road passes are practicable from November to May or June, and the autobus services do not run.

Industries in the Alps. The main industries are those of forestry and dairying in the greater part of the range, and sheep-rearing in the southern zone with Mediterranean climate. The tourist industry is also of great importance in certain areas, particularly in Switzerland, and still newer is the hydro-electrical industry utilising the great water-power of the Alpine torrents. Manufactures utilising this power are increasing. (*See* chapters on the various Alpine countries.)

REFERENCES

Les Alpes, by E. de Martonne (Paris, 1926), gives an excellent short account from the geographic point of view. On structure the following may be noted, though they are intended for the geological rather than the geographical student: *The Structure of the Alps*, L. W. Collet (London, 1927), deals mainly with the central Alps in Switzerland and France. *The Nappe Theory in the Alps*, F. Heritsch, trans. P. G. H. Boswell (London, 1929), gives an impartial account of the various theories of structure. *Bau und Entstehung der Alpen*, L. Kober (Berlin, 1923), and *Bau der Alpen*, R. Staub (Bern, 1924), are classic geological works. On glaciation *Die Alpen in Eiszeitalter*, by A. Penck and E. Brückner (3 vols., 1901-9), is the classic work. *Tectonic Essays, mainly Alpine*, by E. Bailey (Oxford, 1939).

CHAPTER XXIV

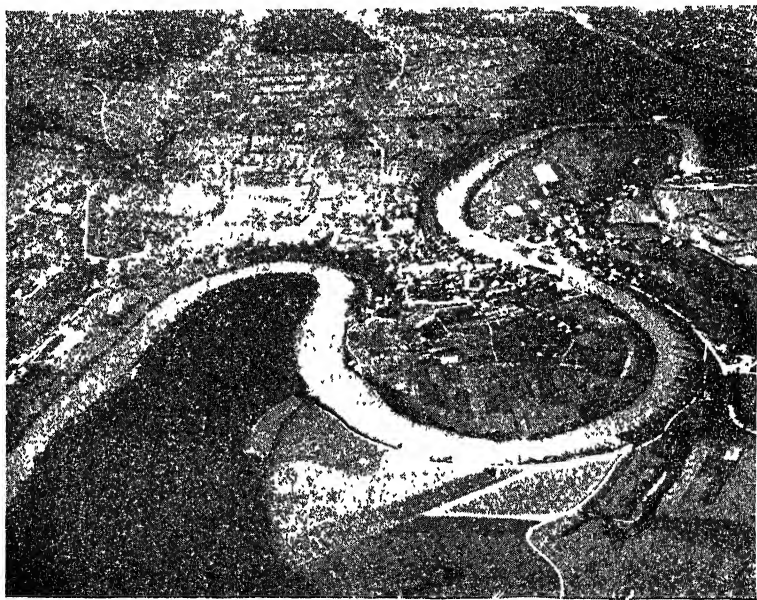
SWITZERLAND

WITH an area of 15,900 square miles Switzerland is one of the smallest countries of Europe, and with 60 per cent. of its surface lying in the Alps and 11 per cent. in the Jura Mountains it is also one of the most mountainous. More than half the population is to be found in the plateau lying between these two mountainous zones, though "plateau" is rather a misnomer, as the Tertiary sandstones, conglomerates, and marls (*Molasse*) of which it is composed are so dissected that in many places it appears to be only a succession of hills.

The Swiss Plateau. This stretches from Lake Geneva (Lac Lemman) north-eastwards to Lake Constance (Boden See), with a length of 180 miles and a maximum breadth of only 30 miles. Not only was it dissected by rivers, but it was afterwards covered entirely by a great ice-sheet formed by the fusion of the great Alpine glaciers at the time of maximum glaciation, though the last glaciation produced only valley glaciers in this area. The various phenomena resulting from the glaciation of a more or less lowland region are present here in great variety, namely, disturbances of the river system, deposition of ground moraine and formation of drumlins, deposition of coarser material from the terminal and lateral moraines which now often forms hills, and deepening and broadening of the valley floors. The Swiss plateau, therefore, shows an alternation of flat-bottomed valleys, often rather wide, with somewhat steep-sided hills which tend to flatten out on top, though the unevenly deposited morainic material with its apparently haphazard distribution disturbs the general scheme. The plateau as a whole varies in height from some 4,600 feet near the Alpine border to some 1,300 feet at the foot of the Jura, and the difference in height between the valleys and summits varies from about a thousand feet in the south-eastern border to a hundred or so on the northern.

The Swiss plateau has the advantage over the neighbouring Alps and Jura in the greater ease of movement, the lower altitude and warmer summers, and, in consequence, out of the twenty-eight Swiss towns of over 10,000 inhabitants, twenty are on the plateau. The plateau carries routes south-westwards *via* the Rhône valley to the Saône-Rhône depression in France, northwards to the Rhine rift

valley, and north-eastwards to the German part of the Alpine Foreland. In itself the plateau is a region of intensive agriculture, for though the winters are cold, cloudy, and often foggy, the summers are warm and rainy and provide ideal climatic conditions for artificial meadows and the production of forage crops, as many as six mowings being sometimes possible in the year. Contrary to general belief, it is the plateau and not the Alpine or Jura zones which carries the greatest number of dairy cattle in Switzerland,



[Courtesy Swiss Federal Railways]

FIG. 105.—VIEW ON THE SWISS PLATEAU.

The little town is Bremgarten in the wide lower valley of the River Reuss. The alternation of intensive cultivation with patches of dense woodland and scattered trees is characteristic.

though the cattle are mainly stall-fed and are seldom visible on the land, except in September, when they are turned out on to the mown fields. This great concentration on dairying is fairly recent. Before the era of cheap imported grain the Swiss plateau necessarily grew its own cereals, but their area is now much reduced. Other crops such as sugar-beet and tobacco are also grown, especially in the south-western part of the plateau. The vine is grown, mainly on the sunny slopes north of Lake Geneva and north-west of Lake Neuchâtel. Orchard trees are to be found planted along the roads in this land

where no space is wasted on hedges. Where the hill-slopes are too steep for cultivation they have been retained under forest, originally mainly deciduous, but generally replaced by conifers.

Considerable but scattered manufactures are to be found over the plateau, mainly using hydro-electricity as power. The manufacture of cheese is widespread, that of Swiss condensed milk and chocolate somewhat more localised. The textile industry is mainly in the north of the plateau, Zürich being the centre of the silk industry established there in the sixteenth century by Italian refugees, and St. Gallen of the cotton textile and embroidery industry, which developed on the basis of an old hand-industry but which received a fresh impetus from French refugees in the

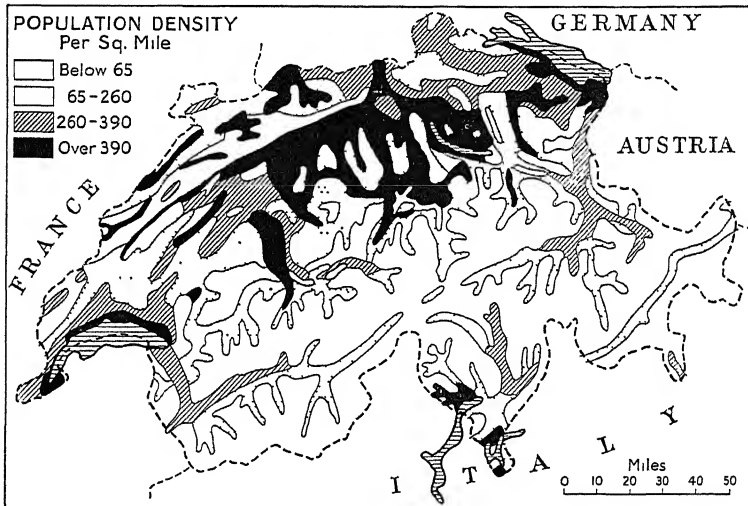


FIG 106

eighteenth century. The manufacture of machine-tools and of many types of machinery (textile, hydro-electric, etc.) is carried on in the north of the plateau and at Geneva. Since the industries are not usually dependent upon coal, they tend to be much scattered throughout the countryside (*cf.* Sweden).

The plateau also has its share of the tourist industry, particularly in the regions bordering Lake Geneva and Lake Lucerne (Ger., Vierwaldstätter See).

Of the towns of the plateau, Zürich (336,000),¹ on the lake of the same name, is the largest, and possesses a very varied industry, including machinery, cotton, leather, etc., in addition to the silk

¹ Population figures are from the 1941 Census

already mentioned. It is also a very important commercial and intellectual centre, with the largest of Switzerland's seven universities. Geneva (124,000), at the western end of Lake Geneva, and formerly capital of the Calvinist state of the same name, is the largest town of the French-speaking part of Switzerland. It is a banking centre, a university town, possesses watch-making and luxury industries, and was the seat of the League of Nations. Berne (130,000), almost surrounded by a great incised meander of the River Aar, is the federal capital, a university town, and manufactures watches and textiles. Only three other plateau towns have more than 50,000: Lausanne (92,000), mainly a tourist centre, also has alimentary industries (chocolate, brewing, etc.); St. Gallen (63,000) is noted for its embroideries, and Winterthur (59,000) manufactures machinery and textiles. The population tends to be scattered in small towns and villages, but attains a density of over 400 per square mile in many cantons (*see* Fig. 106).

The Jura. The structure of the Jura has already been described (p. 173). Switzerland possesses the south-eastern folded portion with many parallel ridges and valleys. The range becomes lower and narrower towards the north-east, and, where it interposes between Basel (Fr., Bâle; *conven. English*, Basle) and the plateau, forms a comparatively slight obstacle. Dairying and forestry are the principal industries of the Jura, with vine-growing on the south-eastward facing outer slope overlooking the plateau. The making of watches and precision instruments, at la Chaux de Fonds (31,000) and many other small towns, is particularly noteworthy.

Basel (162,000) is the great railway junction at the southern end of the Rhine rift, whence routes fan out all over Switzerland. It has important chemical and machinery industries and has a specialised manufacture of silk ribbons. It is also a commercial centre and a university town.

The Swiss Alps. The main lines of structure have already been described. Switzerland possesses a segment of the central part of the Alps where they are highest and narrowest, and in one place reaches across the whole width of the range to touch the North Italian plain south of Lake Lugano. The main industries are forestry and dairying, transhumance of the livestock to the high summer pastures being widely practised. The textile industry of St. Gallen also extends into the Alpine zone. To these occupations has been added during the last eighty years or so the great tourist industry. This developed originally owing to the magnificent scenery of the Swiss Alps and their nearness to those countries of Europe whose inhabitants had money to spend on such holidays,

and it has been fostered in every possible way by the provision of good hotels, roads and railways, and so on.

The Swiss State and People. Although possessing a total population of only just over $4\frac{1}{2}$ millions, Switzerland recognises four official languages. Various dialects of German are spoken by 72 per cent. of the people, French by 21 per cent., mainly in the south-west, and Italian by 6 per cent., mainly in Canton Tessin. In addition, other languages descended from Latin are spoken in the Alps, particularly Romansch, which was recognised as the fourth official language in



[Courtesy Swiss Federal Railways]

FIG. 107.—THE GRIMSEL STORAGE BASIN, BERNESE OBERLAND

This artificial lake is $3\frac{1}{2}$ miles long and has a storage capacity of 3,500 million cubic feet. The dam in the centre of the picture is 375 feet high. Storages are necessary in connection with most of the Alpine hydro-electricity schemes, as about 95 per cent. of the total annual flow takes place in the six summer months.

1937, though it is spoken by only 1 per cent. of the population. This recognition of the rights of people to speak their own language is in accord with the large amount of autonomy possessed by the separate provinces or cantons, and this autonomy dates back to the thirteenth century, when the four cantons round Lake Lucerne organised themselves into the Swiss Confederation on federal and democratic lines.

The considerable importance of Switzerland at the present day, in spite of its small size, is largely due to the exploitation by the

Swiss of the advantages of their geographical position and resources, and to the neutrality which they have long enjoyed. The favourable position as a passage land across the Alps was early realised by the original cantons of the Swiss Confederation which lay athwart the St. Gothard route, while the development of the tourist industry on an unsurpassed scale is one of the latest examples of the grasp by the Swiss of the advantages of their situation. Their consistent neutrality, combined with their policy of asylum to the persecuted of other lands, led to the influx of many refugees, who brought with them various crafts, such as silk-weaving, fine watch-making, hitherto not practised in the country. Also the democratic nature of the country, with an absence of landed aristocracy, meant that capital was not locked up in "country seats" but was free for further investment in industry. Switzerland indeed offers many points of contrast with its neighbour Austria, which began also as a small country of the mountains, but expanded over wide areas eastward, only to be reduced once more to an Alpine state in 1919.

Economic Summary. The productive area of Switzerland covers 75 per cent. of the country, of which 22 per cent. is forested, 41 per cent. grassland, and only 12 per cent. arable. Agriculture is less important than formerly and only a quarter of the population is now engaged in it. Nearly half the population is occupied in industry and the remaining quarter in commerce, administration, education, the hotel industry, and transport. The metallurgical industry occupies some 224,000 people, the textile 140,000, watch-making 60,000, the hotel industry 43,000. The total water-power is estimated at three million horse-power, of which over half is utilised, but a small amount of coal must still be imported.

The imports exceed the exports, but against this must be set the profits of the hotel industry in normal times.

Imports include cereals, raw material for textiles and textiles themselves, minerals (especially iron), and mineral manufactures, chemicals, including fertilisers, and coal. The exports include silk and artificial silk goods, cotton goods, especially embroideries, machinery, clocks and watches, precision instruments, and dairy products, especially condensed milk and cheese.

Needless to say, given Switzerland's dependence on imported foodstuffs and raw materials, on the export of manufactured goods, and on the hotel industry, it can flourish only in a peaceful and stable Europe.

REFERENCES

Dictionnaire Géographique de la Suisse, 6 vols. and atlas (Neuchâtel, 1902-10), was for long the standard work. The monumental work is *Geographie der Schweiz*, by J. Fruh, in 3 volumes, with a separate index volume (1930-1946); a French translation is also available; these deal thoroughly with every aspect of Swiss geography. *Die Landschaften der Schweiz*, by P. Vossaler (Bern, 1928), is accompanied by a portfolio of 20 topographic maps, mainly composite sheets from official sources, which illustrate typical aspects of Swiss topography. See also *Switzerland from the Air* (Zurich, 1926). "Hydro-electric Power in Western Europe," by A. F. A. Mutton in *Geog. Journal*, 1951.

CHAPTER XXV

AUSTRIA

THE break-up of the Habsburg dominions in 1918 reduced Austria from an Empire of 116,000 square miles (excluding the Hungarian possessions) to a small mountainous country of some 32,000 square miles. As the reduced population was almost wholly German-speaking, it would have been scarcely surprising if the country had turned for support to the German Reich, but political union was forbidden by the Allied Powers, and an economic union proposed in 1931 was declared illegal by the Court of International Justice. Eventually, in 1938, Austria was forcibly annexed by Nazi Germany and renamed the Ostmark. Since 1945 the territory of Austria has been divided into four zones of military occupation.

Austria is a typical Alpine area, though it includes a narrow strip of the Hungarian or Pannonian plain on the east, the Danube valley below Passau almost to Pressburg (Cz., Bratislava), and a small part of the "Bohemian" Massif on the north.

The country is twice as large as Switzerland, but its population of six and three-quarter millions is only a third greater. The Austrian Alps spread themselves more widely than the Swiss Alps, but are lower and their great valleys are longer and wider and so the range is more easily penetrated.

Vorarlberg and Tirol. The northern outer bands of Flysch and limestone lie inside Germany, from Lake Constance to the Königsee south of Salzburg, and the Austrian provinces of Vorarlberg and Tirol are situated south of this outer strip. In the west the Vorarlberg touches the eastern end of Lake Constance, which forms the frontier of three countries. The frontier also adjoins Switzerland for a short distance along the Vorder Rhein, and touches the tiny independent state of Liechtenstein farther south. The southern part of the Vorarlberg includes part of the central crystalline zone, the Arlberg railway line running approximately along the line of junction between the limestone and crystalline rocks from Bludenz to Landeck on the Inn. Vorarlberg is closely linked economically with Switzerland, the embroidery industry having spread here from St. Gallen. The Tirol similarly consists of a northern limestone band and a southern crystalline band, both with many peaks, the Inn valley from Landeck to Innsbruck marking the line of junction

in the west, but east of Innsbruck a broad belt of slates and shales (*Bündnerschiefer*) interposes between the limestone and crystalline belts, and the Inn as far as Wörgl follows the northern side of the slate zone and the southern side of the limestone belt. The longitudinal valley of the Inn between Landeck and Wörgl forms the heart of the Tirol. The valley averages about a mile wide, the river itself being usually incised and the broad terraces being very intensively cultivated, maize being one of the leading crops (see Fig. 108). Innsbruck (95,000 with suburbs), the largest town in the interior of the Alps, grew up at the point where the Sill valley (Wipptal), leading down from the Brenner Pass, reaches the wide



FIG. 108.—THE INN VALLEY, NEAR INNSBRUCK.

The glacial terraces form a distinctive feature above the overdeepened valley floor.

Inn valley. The old bridge over the Inn, from which the town takes its name, allowed traffic going northwards to Munich, Augsburg, etc., to use one of the short routes across the outer limestone zone instead of following the Inn valley towards the north-east. The town is now a regional capital and tourist centre. The part of the Tirol south of the Brenner Pass was lost by Austria to Italy in 1918, even though in the north it contained nearly a quarter of a million German-speaking people. In 1939, the majority of the remaining Germans opted for a return to Germany, which included Austria at that date.

The Northern Sedimentary Zone from Salzburg to Vienna. The outer Flysch zone reaches from Salzburg as far as the Wiener Wald

(= "forest of Vienna"), and its rounded hills and mountains are mainly devoted to pasture. The Flysch zone, however, is very narrow here, and the limestone zone which succeeds it on the south almost reaches the outer border of the mountains, and varies from forested mountains in the lower northern region to high, barren karstic plateaus in the inner and higher parts, *e.g.* Totes Gebirge, Steinernes Meer. This outer zone with its numerous lakes is well known to tourists, and so is the border town of Salzburg, which derived its name and wealth from the neighbouring salt mines of Hallein on the Germano-Austrian frontier. These important mines are still actively worked. Salzburg itself, with its castles, palaces, and gardens of the former archbishops, its musical festival and associations with Mozart, remains a smallish place (*c.* 60,000) of great charm.

South of the limestone zone a broad belt of slates and shales interposes in two places between the limestone and the crystalline zones. In the west the slates are continued from the Tirol and extend north of the Pinzgau, *i.e.* the longitudinal stretch of the Salzach, which marks their junction with the interior crystalline zone. East of the Pinzgau the slate strip is missing, so that the crystalline mountains of the Niedere Tauern abut on the limestone belt, until the slates once more appear north of the Mürz in the Eisenerz Alps, noted for their rich iron deposits, from which comes the greater part of the considerable amount of iron-ore produced annually in Austria. The slate-shale mountains are generally lower than the zones to north and south and give rise to softer forms and better pasture.

The Interior Crystalline Zone. The glaciated peaks of the Hohe Tauern generally rise above 10,000 feet, but farther eastwards in the Noric Alps of Carinthia and Styria, where the heights do not generally exceed 6,000 feet, the ice-sheet seems to have been absent or only very patchy, and rounded forms reminiscent of the Carpathians are the rule and are often farmed up to the summits. The Mur-Mürz depression opens a way from the Hungarian basin well into the eastern Alps, the Mur penetrating deeply into the crystalline zone. Brown coal is found in these valleys. The town of Graz (220,000 in 1946), situated where the Mur emerges from the Alps, is the regional capital for this Styrian (Steiermark) part of the Alps and for the productive foothills which border the lower valley of the Mur. The charmingly situated town¹ has become also an industrial centre, using mainly the iron-ore of Eisenerz and the lignites of the Mur-Mürz depression

¹"La ville des Graces sur la rivière de l'Amour," according to the French saying

in its metallurgical industry, and manufacturing also paper and textiles. It is the second largest town of the country.

On the southern side of the crystalline zone is the southern sedimentary belt, the Drave valley west of Villach marking the line of junction. The Klagenfurt depression east of Villach is one of the largest of the Tertiary-filled basins which form a marked feature of the south-eastern Alps. The basin is highly cultivated, cereals, vineyards, and orchards flourishing in the summer heat in addition to the usual forage crops and meadows. The limestone Karawanken Alps on the south of the basin form the present frontier of



FIG. 109.—THE GROSS-GLOCKNER PASS.

This spectacular motor-road links the Drave and the Salzach valleys across the Hohe Tauern. Cloud, not water, fills the valley below the mountain peaks in the middle distance.

Carinthia (Kärnten), the southern part of Carinthia having been lost partly to Yugoslavia and partly to Italy in 1920.

The Danubian Lands of Austria. East of the old frontier town of Passau the Danube hugs the southern edge of the Bohemian crystalline plateau as far as Krems; indeed, in places denudation has removed the overlying Tertiary sands and gravels of the Alpine foreland to such an extent that the underlying hard old rocks sometimes appear even on the south side of the river, which therefore flows through an alternation of basins and narrows. The Danube valley in the stretch between Linz and Krems, *i.e.* the Wachau, is noted for its unspoiled beauty, and the river is here a wide, swiftly

moving stream, whose speed can be realised from the fact that the tourist steamers take only seven and a half hours downstream between Linz and Vienna but seventeen hours upstream. In winter the river is often frozen and in spring the broken ice-floes sometimes get jammed and cause severe floods, hence the low-lying land bordering the river is usually avoided by homesteads and devoted to water meadows.

South of the Danube and north of the Alps the Alpine Foreland is continued from Germany where it is more widely developed. It narrows eastwards to a strip only about six miles wide east of the River Enns. In general, the Foreland consists of hilly country of Tertiary sands and conglomerates. The higher parts (Hausruck,



FIG. 110.—THE DANUBE NEAR DURNSTEIN, WEST OF KREMS.

In this part of its course, known as the Wachau, the Danube has cut into the crystalline rock of the Bohemian Plateau.

2,600 feet) are forested, the lower parts mainly devoted to grass and forage crops and stock-rearing. Linz (73,000 in 1946), on the Danube, is an old bridge town with considerable nodality, the Danubian route being crossed here by north and south routes from the Alps and Bohemian plateau. North of the Danube between the German frontier and Krems is the Waldviertel (=“forest quarter”) on the southern extension of the Bohemian plateau. This is now largely cleared and devoted to pasture or to such crops as rye and potatoes, which are tolerant both of the poor soil derived from the granites and gneisses and of the rather bleak climate, the area being some 1,300 to 2,300 feet above sea-level.

East of a line joining Krems to Znám (Znaim) on the River Thaya the old crystalline rocks sink under a mantle of Tertiaries,

themselves usually covered by löss. Here the fertile soil and lower altitude give possibilities for rich cultures, including the vine, which has given the name of Weinviertel to this region. The Weinviertel is continued northwards across the frontier by the plain of Moravia, and south-eastwards it merges into the Vienna basin.

The **Vienna Basin** lies on both sides of the Danube for some sixty miles from north-east to south-west, but is only about a third of that width across. The part north of the Danube is usually called the Marchfeld. The whole basin represents an area of sinking in which Tertiary sediments were deposited. It provides an area of lowland between the main ranges of the Alps and Carpathians, but is itself limited on the east by hills and mountains considered to be spurs of these ranges, namely, the Leithagebirge south of the Danube and the Little Carpathians north of that river. The Leithagebirge, though nowhere reaching more than 1,600 feet high and crossed by several railway lines, formed the frontier against the Hungarian plain, but the post-1918 addition of the German-speaking communities of the Burgenland in the western part of the Pannonian depression caused the frontier to be moved some twenty miles eastward. The Tertiaries of the Vienna basin are mainly concealed beneath fertile löss and river alluvium, and the area is highly cultivated, especially for forage crops and market gardening which supply the capital city. Well-known wines are produced round the hilly margins. The lowland is encircled by a chaplet of small towns, many of which have considerable industries, such as furniture making, brewing, textile manufacture; while the metallurgical industry (locomotives, agricultural machinery, aeroplanes) was becoming increasingly important between 1919 and 1939. Wiener Neustadt (about 37,000) was the largest of these small centres. A valuable oilfield was discovered in the Vienna basin during the 1930's, and has since been in active exploitation.

The position of the basin is so important that a large city was almost bound to arise somewhere within it. In this neighbourhood the great natural line of movement from east to west, *i.e.* from the Hungarian basin along the Danube valley between the Alps and the Bohemian plateau, is met not only by routes coming from the north, namely, from the Moravian Gate and from the Upper Elbe, but also by routes coming from the south along the eastern edge of the Alps.

The actual site of Vienna (Ger., Wien) is at the foot of the Flysch hills of the Wiener Wald on a river terrace just above the Danubian floods. The city takes its name from the little River Wien, a feeder of the Danube, and the old nucleus of the town kept a discreet distance from the main stream, which is here a braided river,

though it bordered a small western arm, now known as the Danube Canal. In spite of works of regulation, very little building has taken place on the east bank of the main river, which is still liable to floods.

For several centuries Vienna filled the rôle of the most advanced bulwark of western civilisation against intrusion from the east, and continued to grow as the power of its rulers, the Habsburgs, extended eastwards and northwards. Its present large size (1,900,000 in 1934; 1,761,000 in 1951) dates from the time when it was the capital of a great empire, of 242,000 square miles and 50 million people. Before the war of 1914-18 it was the administrative and intellectual centre of the Austrian-Hungarian Empire, as well as the commercial, banking, cultural, and recreational centre of a good deal of south-eastern Europe. It was also, with its satellite towns, the most important manufacturing centre of Austria proper. To a considerable extent it began to function again after 1918 as a centre for a wide area, especially commercially, on account of its long-established traditions and experience, its central position and its widely known language, and because of the need for such a centre in this much divided part of Europe. As regards industry, Vienna possesses manufactures very similar to those of Paris, and specialises in the manufacture of fashionable clothes, fine furniture, pianos, and luxury articles noted for their good taste and elegance. The old traditions of the city as a home of the arts, especially music, should continue to attract many tourists.

Economic Summary. With the exception of Vienna the whole country is extremely rural, all the other towns, even Graz and Innsbruck, being sufficiently small for the surrounding mountains to loom large above the roof-tops. Nearly all the energy of the state seems to have gone into the capital city or into administering the empire, and the countryside is generally less developed than in the corresponding zones of Switzerland. Less effort was made to exploit the Austrian Alps as a tourist resort, agriculture was run on less modern lines, and water-power was less developed; but energetic steps were being taken to remedy these defects during the 1930's. The small, picturesque towns, which often have the air of being two hundred years behind the times, proved a great attraction for tourists.

There is a much greater proportion both of forest and of arable land in Austria than in Switzerland, the forest covering 37 per cent. and the arable land 23 per cent. of the total area. The large amount of forest is a valuable source of wealth, with the modern world shortage of timber. The amount of food produced in the country

would probably cover home requirements, were it not for the disproportionate size of Vienna.

Austria is better off than Switzerland as regards minerals, and possesses a considerable surplus both of iron-ore and salt. Its hydro-electric possibilities are much the same, but only half a million horse-power has been developed: large new stations are however being built in the Hohe Tauern at Kaprun and along the Danube between Passau and Krems. Vienna depends on imported coal, but about 4 million tons of lignite are produced. An oilfield has recently been developed in the Russian zone at Zistersdorf.

Industry is confined mainly to the Vienna basin, Graz, and the Vorarlberg, as already mentioned, though the wood and paper industries are naturally rather scattered.

REFERENCES

Die Ostalpen und das heutige Österreich, by N. Krebs, 2 vols. (2nd ed., Stuttgart, 1928), is the standard work. A valuable short account in English of the physical geography of the country is given by the same author in Baedeker's *Austria* (1930). On the historical side, see *The Habsburg Monarchy*, by H. Wickham Steed (London) "The Survival of an Independent Austria," by G. W. Hoffman in *Geog. Review*, 1951, and "TVA on the Danube?" by G. Kiss in *Geog. Review*, 1947

SECTION V—SOUTH-CENTRAL EUROPE

CHAPTER XXVI

GENERAL INTRODUCTION TO SOUTH-CENTRAL EUROPE

THE countries included in this region are Hungary, Romania, Yugoslavia, Bulgaria, Slovakia, and Albania, with certain portions of adjacent lands, particularly the Carpathian portions of Poland and of the U.S.S.R., and the European portion of Turkey. The Greek peninsula and islands are excluded on account of the contrasts in climate and in mode of life induced or fostered by differences in build and world position. On the other hand, the narrow coastlands of the north-eastern Adriatic and of the northern Ægean have been included here for the sake of clearness in dealing with their structure, but climatically and to some extent culturally they belong to the Mediterranean region.

This region of south-central Europe includes two great systems of young folded mountains, the Carpathian-Balkan and the Dinaric, and these enclose two great basins, the Pannonian (or Hungarian) and the Lower Danubian (or Romano-Bulgarian). The third important element is the crystalline mass of the Rhodope, which lies like a wedge between the Balkan and the Dinaric folded ranges and which probably continues beneath the Pannonian basin. The Pelagonian mass, which lies between the Vardar valley and Lake Prespa and extends into Greece, is similar in character to the Rhodope mass and only divided from it by a very narrow strip of country. Geographically they may be treated together. There are a few minor structural elements, such as the Dobruja Platform and the Tekir Dag, which stand apart from the rest of the area. Bessarabia and eastern Moldavia belong to the Russian Platform. (See Fig. 3.)

Physical Evolution. The whole region probably lay beneath the sea in Cretaceous times. At the end of the Cretaceous era the Carpathian and Balkan folds emerged, to be followed in the Miocene period by the Dinaric system and by additions to the Carpathian system. At the same time the Rhodope mass came into evidence,

but sustained dislocations, with the result that large segments sank and fault-bounded basins were widely developed. In consequence, the ancient sea was split up into a number of lakes, of which the



[Courtesy Romanian Legation]

FIG. 111.—THE KAZAN GORGE ON THE DANUBE.

View looking downstream. Note the relatively even skyline of the peneplained mountains through which the gorge was cut at the close of Tertiary times. Drainage of the Pannonian basin followed.

largest occupied the Pannonian basin, and as the waters of this lake stretched considerably beyond the present lowlands, sediments were deposited over the lands which now border the right bank of the River Save as well as over the present Transylvanian basin. Another

large lake deposited its sediments in the region of the Romano-Bulgarian basin, which was connected with the Pannonian lake by means of a strait occupying a transverse depression between the Carpathian and the Balkan Mountains. The Pannonian basin was also probably connected southwards with the branching Ægean lake, which occupied faulted basins in the present Rhodope and Pelagonian masses as well as covering what is now the northern part of the Ægean Sea.

It must be stated at once, however, that the present height and relief of the young folded mountains of this area are not due to the preliminary folding, nor even to the further folding that took place in Miocene times. Both systems of young folded mountains were subsequently reduced to plateau conditions and in some areas to peneplains, and their present high elevation is due to subsequent epeirogenic rising at the close of Tertiary times. Both the Carpatho-Balkan and the Dinaric systems, therefore, show well-developed plateau forms, several levels being usually recognisable. The mountains consist, as a rule, of rounded bosses and wide upland slopes, which are often forest-covered and are reminiscent of such Hercynian masses as the Vosges or Black Forest rather than of the Alps or central Pyrenees. Alpine forms are entirely lacking in the Balkan Mountains, as their low elevation precluded a Quaternary glaciation. In the Carpathian system only the highest mountains show the characteristic Alpine forms, such as arêtes, cirques, etc. The Dinaric system also presents few Alpine features, and these are to be found mainly in the Prokletije (= "Damned Land"), sometimes known as the North Albanian Alps.

In late Tertiary (Pliocene) times the fresh-water lake which had filled the Pannonian basin began to be drained off and became divided into a number of smaller bodies of water, of which the present Balaton and Neusiedler lakes are remnants. Similar drainage took place in the Romano-Bulgar basin. The ancient Ægean lake and its branching arms remained for a somewhat longer time; in fact, they were not drained off until the foundering of the northern Ægean, which probably took place in early Quaternary times. (See Fig. 135.)

In connection with the disappearance of these inland waters, there remain many terraces bordering both the ancient lakes and present river valleys, bearing witness to the intermittent manner in which the waters were lowered. These terraces, usually composed of soft rocks of Tertiary age, and often löss-covered, are now often much dissected by sub-aerial erosion, and form a transition between the flat grain-growing basins and the bare or forested

mountains. They provide good land for mixed farming and fruit-growing, and offer suitable sites for settlement. Consequently they are a feature of great geographical importance for this area. A further effect of the lowering of the base level of erosion was the large amount of river capture, and the formation of numerous gorges.

In connection with the Tertiary earth movements there was much out-pouring of volcanic material, though there are no recent volcanoes. It seems, however, that parts of the region are still undergoing elevation, at any rate in the Dinaric system, but the Pannonian basin and Walachian plain have continued to sink and are largely covered with very recent sediments.

Modern Theories on the Tectonic Affinities of the Danube Region. A beautiful if somewhat startling simplicity has been introduced into the structure of this area by the recent work of Kober and other geologists. The whole area is visualised as essentially forming part of one tectonic system only. (See Chapter I, and Fig. 3.) The system of mountains known to geographers as the Dinaric is said to correspond to the upper or Dinaric *nappes* of the Alps, the Pelagonian and Rhodope masses are considered to represent *Zwischengebirge* or "median masses" similar to the masses of Corsica and Sardinia, and the Carpatho-Balkan system to correspond to the lower *nappes* of the Alps. The Rhodope mass is believed to extend beneath the Hungarian basin, as evidenced by hills with cores of an ancient rock, such as those between the Save and the Danube, near Pécs, and the Bihar Massif. These new theories are somewhat difficult to reconcile with the older ones, especially as regards the Rhodope mass, but they have many adherents.

Climate and Vegetation. The whole area, with the small exception of the Dalmatian coast, has cold winters. On the other hand, the summers are hot, except in the high mountains. Precipitation occurs all the year round, though in the form of snow in winter. Spring and summer are the rainiest seasons over the greater part of the area. Only in the extreme south and west is there a tendency towards summer drought, especially on the Dalmatian coast, in the Albanian lowlands, and on the north Ægean coast. (See table of climatic statistics at end of Chapter II.)

The typical vegetation is deciduous forest, of central European type, grading into coniferous forest. Hardly anywhere do the rounded summits rise above the tree level, so there is little true *alp* or *alm*. High pastures above the forest level have been formed or increased by clearing the timber in order to give summer pasture. In the most sheltered parts of the basins, where low rainfall is

combined with porous soil, grass has been the natural vegetation during historic times; as in the Alföld, the Romano-Bulgar basin, and in the basin of the lower Maritza. These areas have mainly been utilised for the growing of grain, but in a few cases they are too dry and offer only poor grazing. Other exceptions to the usual forest-cover occur in regions of very pure limestone, such as the Karst region of the Dinaric system, and on a smaller scale in parts of eastern Serbia and Macedonia.

The wide range of cultivated crops includes wheat and maize, the vine, and tobacco. Fruit trees flourish, particularly plums and apples, the rapid transition from winter to summer reducing the danger from spring frosts to a minimum.

Mineral Wealth. The area has little coal and iron, so that the main bases of present-day industrial development are absent. The only two minerals which occur in really large quantities are petroleum and salt, the former chiefly on the outer flanks of the Carpathians and the latter on both sides of that range. Metallic ores occur in great variety in the mountains, often in association with the Tertiary volcanic activity, but the deposits are small with the exceptions of bauxite, copper, and zinc. Considerable deposits of lignite exist, and there is some natural gas in the Transylvanian basin.

Water-Power. There are no great possibilities for the development of water-power. With only moderate rainfall, no perennial snow, and few lake storages, the area has no supplies of "white coal" comparable with those of Scandinavia, the Alps, or the Pyrenees. Moderate amounts are available, however, in the Carpathian and Dinaric systems, more especially in Yugoslavia. The large number of gorges gives opportunity for suitable power sites.

The swift-flowing Danube could be profitably harnessed where it breaks through the mountains, but any great project of this kind must probably await some kind of federation or international policy for this area. It has been said there the Danubian lands need something on the lines of the American T.V.A.

Historical and Economic Developments. The lands of south-central Europe must be looked upon as backward compared with those of western and central Europe. Since they have little coal, iron, or water-power, one could hardly expect great industrial development, but even farming is in a primitive condition, with the exception of Hungary and the Slovene area of Yugoslavia. Subsistence farming is the rule, farm machinery is very primitive, and the rearing of live-stock quite unscientific. The backwardness of these lands must be attributed largely to the fact that they bore the brunt of the Turkish attacks on Europe, and also to their position on the

line of movement of most of the great earlier incursions from eastern Europe and Asia. With minor exceptions they all fell under the blighting Turkish rule. The lands of the north and west were the last to be conquered by the Turks and the first to free themselves. Hungary, for instance, was conquered by the Turks in 1526 and obtained its freedom in 1699, but the liberation of the countries nearest to Constantinople came very late. Romania freed itself from Turkish suzerainty only in 1878, though virtual independence was established in 1861; the nucleus of modern



FIG. 112.—DJAKOVICA, YUGOSLAVIA.

This small town near the borders of Yugoslavia and Albania has a strongly oriental appearance, with its Mosque and black-robed figures of veiled women. Under Turkish rule until 1913, the region was formed into the Kossovo-Metohija autonomous area by the new constitution of 1946, as it contains a majority of people of Albanian speech.

Yugoslavia was formed in 1817, but the Niš area was not added until 1881 and the Vardar area not until 1912-13; independent Bulgaria dates only from 1881, and Turkish suzerainty was not definitely abandoned until 1908.

Great efforts were made by all the countries between 1918 and 1938 to catch up with western Europe. For instance, considerable industrial expansion took place; communications, though very inferior to those west of Vienna, were markedly improved; education was made available to larger numbers. Visual evidence of progress could be seen particularly in the rebuilding of cities on modern

lines. Belgrade and Bucharest were almost entirely rebuilt, while substantial new houses and usually a new school could be seen in almost every village of Slovakia, Romania, and Yugoslavia. The manufacture of cement for building was one of the most important and flourishing industries. The whole standard of housing and hygiene was rising.

Naturally, the Oriental influence remained strong where the Turks had held sway for the longest time. In Skoplje, for instance, there are two distinct towns, the old Oriental town on the left side of the river, where the merchants still sit cross-legged in the great bazaar, and the well-laid-out European town on the right bank. Sarajevo also has an Oriental quarter. Most of Bosnia and south Serbia may be looked upon as a living museum of cultural anthropology, and many of the inhabitants still wear Turkish costume (now banned in Turkey itself), and the Moslem women still veil their faces. The Balkan peninsula contains the only section of Europe in which Mahommedanism is professed by any considerable numbers.

One of the results of the Turkish invasions was the flight to the mountains of large numbers of the agricultural people, where among the broken, forested country it was difficult for the Turks to attack and where the poverty of the country made it not worth while to do so. In the small fertile basins south of the Save-Danube line the Turkish conquerors forced the local inhabitants into serfdom, whereas the peasants in the mountains largely retained their freedom. Portions of the great open plains were almost completely depopulated, particularly those areas which are exceptionally flat and offer no good defensive sites, such as the plains of the Banat and Walachia. The characteristic Walachian dwelling from the dawn of history may perhaps be related both to the constant danger from marauding invaders and to the conditions of vegetation and climate, since it consisted merely of a pit dug in the earth, with a roof of grass or reeds barely above the level of the plain.

The Magyars alone managed to retain their position on the open plain with any degree of success, but as they themselves were a horse-riding nation organised on a military basis and had played a rôle a few centuries earlier similar to that of the Turks, this is hardly surprising. Indeed, it was their sudden and unexpected collapse in 1526 that surprised the Turks and not the excellent resistance which they had hitherto maintained.

Apart from the Magyars, most of the population may be looked upon as having become refugees in their mountain fastnesses, where they were cut off from contact with western Europe and consequently from the changes that were taking place there. Somewhat in the manner of the "poor whites" of the Appalachian

Mountains in America, old customs and beliefs and primitive ways of life continued. For instance, the country people still spin and weave their own wool and flax for their picturesque local costumes, which they wear as a matter of course and not, as in western Europe, self-consciously with an eye on the tourist. Illiteracy is high and superstition rife.

Similarly, old institutions such as serfdom lingered on after they had disappeared from western Europe. The Hungarian serfs, including those of Slovakia, Transylvania, and Croatia, were freed in 1839, those of Romania in 1864, and those of the Balkan areas with the withdrawal of the Turks. The liberation does not seem to have been very beneficial to the peasants, however, and at the outbreak of the war of 1914-18 there was a very pronounced land hunger, which was satisfied, particularly in Romania and Yugoslavia, by measures of agrarian reform which divided up the great estates and distributed the lands among the peasant farmers. Hungary still showed vast latifundia side by side with tiny holdings until the redistribution following 1945, but Bulgaria has long been an essentially peasant state. It may be added that peasant subsistence farming does not necessarily, or even usually, make the best use of the land, unless it can be combined with cooperative marketing of the surplus produce, some help (Government or co-operative) in providing mechanised farm implements, good seed and fertilisers, and some adequate means of acquainting the farmers with improvements in agricultural technique. On the whole, the large holdings represented the best farmed land, with a few notable exceptions, such as the dairying districts of Slovenia, and the horticulture of the Dalmatian coast. All the countries of south-central Europe suffer from rural over-population, there being more people engaged in farming than the land can feed adequately. Both industrialisation and emigration have been suggested as remedies.

The predominance of peasant farmers had an adverse effect on the commercial and industrial development of the countries, and on the smooth running of government and public services. Except in Hungary, few people could be said to belong to a middle class, and even these small numbers were often Jewish; south-central Europe, therefore, was handicapped in its attempt to catch up with more advanced parts of the world, not only by shortages of fuel and poorness of communications, but also by a marked shortage of trained personnel. Moreover, subsistence agriculture does not lead to the accumulation of capital, and this proved another drawback.

Another feature of south-central Europe as a whole is the intermingling of peoples and the difficulty of drawing frontiers on national lines. This intermingling is the result of various causes. In empires as large as those of Turkey, Austria-Hungary, or Russia movements of peoples could take place more easily than between one national state and another. Also, in order to hasten the colonisation of the Banat and of Bessarabia the Austro-Hungarian and Russian empires invited settlers from outside their own dominions. Moreover, these lands attracted people from Serbia and Bulgaria, which were still under Turkish domination. Hence the population of such areas became exceedingly diverse. The late crystallisation of modern national states in this part of Europe led to the inevitable inclusion of considerable minority populations, the only alternative being wholesale deportations, as in the case of Turkey and Greece.

Finally, the small size of the states of south-central Europe proves a handicap in the modern world.

REFERENCES

Part II of *Europe Centrale*, by E. de Martonne (Paris, 1931), and *Länderkunde von Mitteleuropa*, by F. Machatschek (Leipzig and Vienna, 1925), deal with the region north of the Save-Danube line. For the region south of that line J. Cvijić's *La Péninsule Balkanique* (Paris, 1918) is the classic work, though much is now out of date. *Economics of Peasant Farming*, by Doreen Warriner (Oxford, 1939), deals with this important subject as regards Poland, Czechoslovakia, Hungary, Romania, Bulgaria, and Yugoslavia. The following works are also recommended: *Manuel Géographique de Politique Européenne, Tome I, L'Europe Centrale*, by J. Ancel (Paris, 1936), and *The Eastern Marchlands of Europe*, by H. Wanklyn (London, 1941).

For pronunciation of words in Magyar, Romanian, etc., see *A Guide to the Languages of Europe*, by A. Lyall (2nd ed., London, 1935).

CHAPTER XXVII

THE MIDDLE DANUBIAN BASIN

THIS depression, also known as the Hungarian or Pannonian basin, rises on all sides to mountainous country. Its middle portion belongs to Hungary and its outlying parts are now divided between a number of states, namely, Romania, Yugoslavia, and Austria. As the area forms a physical unit, however, it will here be treated as a whole.

Not only was the area subsiding in Tertiary times, but it continued to sink during the Quaternary period. It contrasts, therefore, with the Transylvanian basin, where Tertiary material remains at the surface and has been much dissected. Sedimentation is still active in many parts of the Hungarian basin, particularly along the Tisza and the lower courses of its left-bank tributaries, *e.g.* Körös, Maros, and Temes, which are still liable to great floods, in spite of much labour expended in regulating their beds. Löss is found on much of the higher ground such as the old lake terraces and on the bordering hills, and sporadically in the lowlands themselves, but alluvium and blown sand have covered up the löss deposits in most of the low-lying parts.

The region is not entirely flat, though there are large stretches of level ground. The hills of central Hungary cross the Danube near Budapest and stretch from north-east to south-west. Another line of hills lies between the Drave-Danube and the Save, where they appear under a number of different names but can be included under the heading of Croatian-Slavonian hill country.

The Danube is the only river which breaks through the surrounding mountain ring, though there are a number of relatively easy exits in the form of saddles and passes which are followed by railways and roads. Indeed, the surrounding mountains are not the barrier they appear at first sight, as they are threaded in numerous places by deep and broad valleys which give opportunities of penetration. Moreover, the surrounding ring of mountains both narrows and diminishes in height in a remarkable manner in two places. The Karstic saddle in the south-west is the more important of these, as it leads from the well-populated lands of eastern Austria and western Hungary to the head of the Adriatic. The second is the remarkable narrowing of the Carpathian mountain system near the headwaters of the Tisza in the north-east.

The Little Alföld.¹ This small, hill-girt plain is situated in the extreme north-west of the basin. It is separated from the Vienna basin by a line of hills running at right angles to the Danube and forming a link between the Alps and the Carpathians. The flatness of the middle portion of the basin allows the Danube to divide into several arms in a district that formerly was very swampy, but has been largely reclaimed and is now used for pasture or for the growing of vegetables. Southward the land rises, and late Tertiary deposits emerge from beneath the alluvium. Grain cultivation here becomes dominant, though there are also many orchards, which increase in number towards the southern foot-hills. This region is one of ancient settlement, in contrast to the recent development of the Great Alföld, and it contains a number of old picturesque villages and small towns, mostly of German origin. The river ports of Bratislava (Ger., Pressburg; Hung., Pozsony; 173,000), in Slovakia, and the twin ports of Komarno (Slovak) and Komárom (Hungarian) (about 21,000), lie in this region.

The Hill and Plateau Region of Central Hungary. This may be divided into three parts. First, the mountains, largely volcanic in origin, which stretch in an east-north-east to west-south-west direction from the River Bodrog to the Danube. The greatest height reached is about 3,300 feet.

To the south-west of the Danube the Bakony Forest continues in much the same direction, with a maximum height of about 2,300 feet. The strata, of ages varying from Carboniferous to early Tertiary, are lightly folded and considerably faulted and may perhaps be connected with the Alpine folds. Both lines of hills retain a considerable amount of their deciduous forest cover, though much clearing has taken place.

South-east of Lake Balaton, which lies at the southern foot of the Bakony Forest and has a maximum depth of only 36 feet, lies a third section of this region. This is in reality a low, lightly dissected plateau covered with löss and intrinsically very productive. From this plateau north of Pécs and north of Székesfehérvár respectively, rise two hill masses with granitic cores of which the former is the larger and higher, reaching 2,648 feet. These two groups of hills are considered to be vestiges of the sunken massif which underlies the whole basin and may be connected tectonically with the Rhodope block. Like the Little Alföld, this region west of the Danube is a land of old settlements, with towns founded in the Middle Ages, and a population that has long been devoted to a diversified agriculture.

¹ "Al"=low, "föld"=country or land.

The capital city itself, Budapest, originated in a settlement on the right bank of the Danube where the hill country reaches the river. The original mediæval town of Buda, with its good defensive position, has long been surpassed in size by Pest on the flat land on the east or exposed side of the river, but the dual city was still expanding rapidly in all directions in the 1930's. It was perhaps the most beautiful inland city of Europe before the siege of 1945. The original settlement had naturally a good position for trade. The river narrows at this point and is free from the braiding, cut-offs, and swamps which hinder settlement and movement north and south of the town. The river was fairly easily crossed here, but the

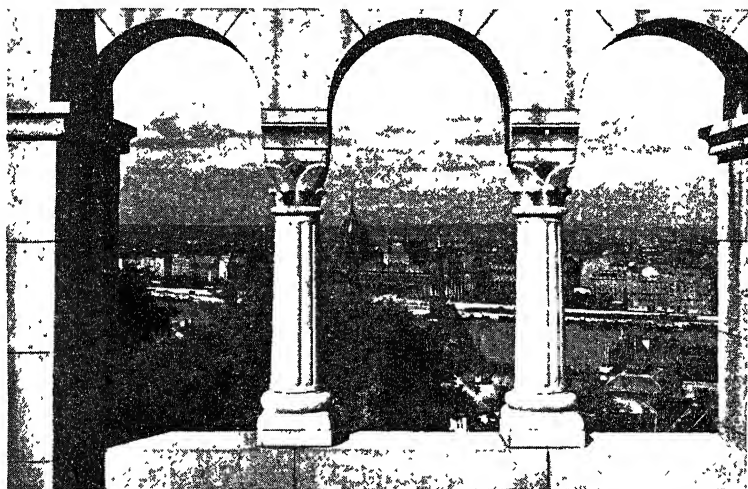


FIG. 113.—BUDAPEST.

The view is taken from the heights of Buda looking eastward across the Danube to Pest. Much of the city, including the structure in the foreground, was destroyed in the fighting at the end of the war.

first permanent bridge was built as late as 1849 (by English engineers), and superseded the earlier pontoon bridges. In the old days, when the river itself formed one of the main lines of movement, traffic followed the river gap through the mountains to the north-west of the town. The modern Orient Express route passes through Budapest on its way between Vienna and Constantinople (Istanbul), but uses a gap to the south of the cutting made by the river.

The Great Alföld. East of the Danube, between Budapest and Belgrade, the land stretches almost flat to the foot-hills of the Carpathian mountain system, though even here there is some physical contrast and the main unity is one of climate. This part of the plain

has a more Continental climate than the regions already dealt with, and experiences severe winter cold and severe droughts in late summer. The original vegetation was probably wooded-steppe, though trees and bushes may have been lacking on the sandy and alkali tracts, and seem to have disappeared even in the more favoured areas during early historic times. Hedges and trees are now conspicuously absent, except for willows along the swampy borders of the few main rivers, or where acacias, eucalypts,



[Photo: Margaret R. Shackleton]

FIG. 114.—THE BUGÁC STEPPE, NEAR KECSKEMÉT.

This is one of the two main areas of uncultivated steppe in the Great Alföld, the other being the Hortobágy near Debrecen. The soil is heavily saline, but provides pasture for cattle, which are mainly a cross between the white long-horned Hungarian type and other breeds. Small plantations of eucalyptus and pine trees have been made in places, and can be seen in the distance.

pinces, and other drought-resisting trees have been planted round farmhouses and villages. Up to the early years of the nineteenth century the region was devoted to the rearing of horses, cattle, and, to a less extent, sheep. Nowadays the greater part is cultivated and there are only small areas, mainly those of loose, infertile sandy soil and swamp, which are not under the plough. The crops are very varied. Cereals, particularly maize and wheat, form the chief cash crops, though melons, tobacco, paprika, and many others are

widely grown. Cattle are reared in large numbers, but are now mainly stall-fed instead of being turned loose to graze. Pigs and poultry, especially geese, are numerous, being fed mainly on the abundant grain.

Between the Danube and the Tisza lies a region which is higher and drier than the low-lying swamp country to the east of the Tisza River. This region of Cumania is largely covered with sand, now to a great extent devoted to vineyards, the vines on the sandy soil being especially free from phylloxera. Peaches and apricots are also widely grown near Kecskemét (about 82,000), which is a great fruit centre, the explanation of the productivity of this region being that the sand cover is usually thin and the löss can be obtained from below and mixed with the surface soil. Even so, the successful planting of trees in the Alföld demands great care and a special technique. South-east of Kecskemét the soil is impregnated with salts and there is a large area of *puszta* (= "waste"), known as the Bugác steppe. Here may still be seen the original white Hungarian cattle. They can stand great heat and drought and make excellent draught animals, but provide little milk and fatten only slowly, so that they have been largely replaced by cross-bred cattle. The place of butter on the Alföld is taken by lard, though of course butter can be obtained in hotels. South of Subotica (100,000), now in Yugoslavia, lies a fertile löss-covered region devoted mainly to cereal and sugar-beet cultivation,

Part of the sandy region north of Debrecen (126,000)¹ has also been reclaimed for cultivation, though Hungary's largest area of *puszta*, known as the Hortobágy, lies west of this town.

The population distribution on the Alföld shows some rather curious features. On the one hand is a concentration into large towns, which, however, usually retain much of the appearance of villages, or "garden cities," as their centres have few large buildings or shops to give an urban character, while the houses are usually of only one storey and each stands in its own garden. On the other hand, between the towns the population is extremely disseminated and the countryside is dotted with scattered farmhouses on smallish holdings, known as *tanyas*. The *tanya* system was developed after the withdrawal of the Turks in order to cultivate lands which had been long neglected. At first the buildings were merely makeshift and the cultivators lived in them only temporarily, returning to the towns after the harvest was over, but some *tanyas* were permanent from the beginning, and in some regions, notably near Hodmészővásárhely,² the *tanyas* give a very geometrical pattern to the landscape.

¹ Population at 1941 census

² Literally = Beaver meadow market place.

The Croatian-Slavonian Hill Country. Between the Drave and Save lies the Croatian-Slavonian hill country (now in Yugoslavia), a fertile, well-cultivated region broken by a line of hills running from west-north-west to east-south-east. These hills all contain a core of ancient rock and are believed by some geologists to be connected tectonically with the Rhodope and by others with the central crystalline Alps. Most of these hills retain some forest cover. The basins of Ljubljana and Zagreb belong tectonically to the Alps, and politically to Yugoslavia.

HUNGARY

The Hungarians entered the middle Danubian basin from the east in the ninth century. The name Magyar¹ was at first confined to the clan of one of their great conquering chieftains, but was later, however, extended to cover all the Hungarian tribes or clans. Their earliest known home was between the Sea of Azov and the southern Urals. Their language belongs to the Finno-Ugrian group, of which Estonian and Finnish are the only other European representatives. They were probably already a mixed ethnic group when they migrated westward, but they were definitely *not* Mongolian, the few present-day Hungarians of Mongolian appearance being descended from the later Tatar invaders.

The Hungarians found the middle Danubian plain occupied only by a scanty population, which was composed partly of the disorganised remnants of earlier migrations, *e.g.* Avars, and partly of Slavonic-speaking people whom the Avars and others had previously conquered. The newcomers were able to establish themselves securely in the central plain, where they largely absorbed the existing population, and they extended their rule into and often beyond the surrounding mountains.

By forming a solid, coherent state in the middle of the mountain-girt plain, the warlike Magyars were in a very dominant position, particularly as easy routes led up into the mountains and afforded lines of penetration and settlement.

Their empire first showed signs of instability, however, in the fourteenth century, when Walachia emerged as an independent state and when at the same time the Serbs and Bulgars started to reassert themselves. The desire of these latter peoples for political freedom was nipped in the bud by the Turkish conquests, but few of the peoples of the surrounding mountains became Magyarised, and after a thousand years of eclipse the Slavonic-speaking peoples (of Slovakia, Ruthenia, and Croatia), as well as the Romanians of Transylvania, became conscious of national aspirations, with the

¹ Pronounced *Modjer*.

result that after 1918 Hungary was reduced to a small state of 36,000 square miles (*i.e.* rather larger than the whole of Ireland) with $8\frac{1}{2}$ million people, of whom about 90 per cent. speak Magyar.

Historically the Magyars had the misfortune to be placed between the advancing Turks and the rising tide of Germanism. Though allied to the Turks by tradition and perhaps partially by race, yet the Magyars became so devoted to the European and Christian ideal that they for long formed a bulwark for western Europe against the Moslems. Their eventual subjection to the Turks took place at a particularly unfortunate time when western Europe was emerging from mediæval into modern times. Consequently, through no



[Photo: Margaret R. Shackleton]

FIG. 115.—AN ISOLATED FARM (TANYA) IN THE GREAT ALFÖLD.

This farm, near Szolnok, east of the Tisza river, has typical features in the veranda, the few acacia trees for shade and the balance-beam well.

fault of her own, Hungary lagged behind the western nations, and the subsequent struggle for independence against Austria further weakened her, so that not until after the *Ausgleich*, or compromise, of 1867 was Hungary free to make the great spurt which brought her once more into a prominent position.

With its level surface of fertile soil, Hungary is pre-eminently agricultural. About 60 per cent. of the total surface is under the plough, a higher percentage than that of any other country in Europe except Denmark. Pasture covers about 18 per cent., forest 12 per cent., vineyards and gardens about $3\frac{1}{2}$ per cent. Of the ploughed land about three-quarters is devoted to cereals.

The number of pigs, cattle, sheep, and horses is high, and the livestock industry may be compared in intensity to that of the Maize Belt of North America.

There was a large quantity of agricultural produce available for export, but one of Hungary's main difficulties between 1918 and 1938 was to obtain markets for her farming commodities. Most of her neighbours are also agricultural countries, and Germany, her great industrial neighbour, adopted a policy of agricultural and monetary self-sufficiency which put great difficulties in the way of international trading. Hungary was able to export many commodities for which there was a demand in England, such as wheat, fruit (peaches, apricots, melons), good cheap wine, eggs, poultry, and game birds, but her inland position makes transport a difficult problem, especially of perishable commodities, though the exports to England were increasing before 1938. It is rather curious, however, that the superfine Hungarian flour which has long enjoyed a great reputation in Germany, should be practically unknown in England.

One would not expect to find great mineral wealth or water-power in a plain of Quaternary sediments, and Hungary's mineral deposits are limited to bauxite, coal, lignite, petroleum, and a very small amount of iron. Jurassic coal is found near Pécs and lignite near Salgotarjan and in the Pilis hills, north-west of Budapest, about eight million tons of lignite being produced in 1938 and about a million tons of coal. Half a million tons of bauxite were produced in 1938.

Industries are more developed than might be expected. Flour-milling is the most important, especially at Budapest, Győr (about 51,000), Debrecen, and Szeged (137,000). The sugar and brewing industries work mainly for the home market, though there is an export of preserved meat (sausages) and other preserves. The machinery, textile, tobacco, and shoe industries are all quite substantial, especially at Budapest which concentrates over half the manufactures of the country.

Budapest, with about $1\frac{1}{2}$ million¹ people in pre-war days, holds a very dominating position in Hungarian life. The city is not only the administrative centre of the country, but the chief manufacturing and commercial centre as well as the seat of the leading university. It is also the chief health resort and holiday town, largely owing to the occurrence of natural springs of all kinds, which have been turned to good account for both recreation and healing purposes.

¹ The population in 1949 was 1,058,000.

Apart from Budapest, none of the towns is of great size, and few are situated on the two great rivers. The oldest towns occupy defensible positions west of the Danube, such as Székesfehérvár (lit.: =seat white town; cf. German; Stuhlweissenburg), which was the old capital as early as the tenth century. Esztergom, on the Danube, is the "Canterbury" of Hungary, while Veszprém is the seat of a bishopric founded by King Stephen in 1001. The comparative absence of towns along the river banks in the Alföld is due to danger from floods, Szeged having been practically destroyed by flood in 1879. Within the last 80 years, however, great works of regulation have been carried out and hundreds of miles of protective dykes erected.

REFERENCES

- Ungarns Land und Volk*, by E. von Chelnoky in *Ungarn* (Budapest, 1917). *Wirtschaftsgeographie des ungarischen Grossen Alfölds*, by Kurt Treiber (Kiel, 1934). *Hungary*, by Clive Holland (London, 1935). "The Danube as a Waterway," by H. Ormsby (*Scott. Geog. Mag.*, 1923). There are numerous publications in Hungarian, e.g. *Magyarország Földrajza*, by E. von Chelnoky. "The Role of Peasant Hungary," by H. Wanklyn in *Geog. Journal*. 1941.

CHAPTER XXVIII

THE CARPATHIAN SYSTEM

THE Carpathians, from the Vienna basin to the Iron Gate, have about the same length as the Alps, but only about half their average height with no summit exceeding 9,000 feet. As a consequence of their position they have played a less important rôle in history, are much less important economically, and have a smaller and much more backward population. Although easier to traverse, there are considerably fewer railway lines across them. Less is known about the geological structure of the Carpathians than that of the Alps and they are much less adequately mapped. Owing to their lower height they possess no glaciers at the present day and there was less glaciation during the great Ice Age. Accordingly there is very little Alpine scenery and therefore less to attract tourists. The Tatra Mountains alone present the phenomena of intense glaciation, though the Transylvanian Alps show Alpine forms in places.

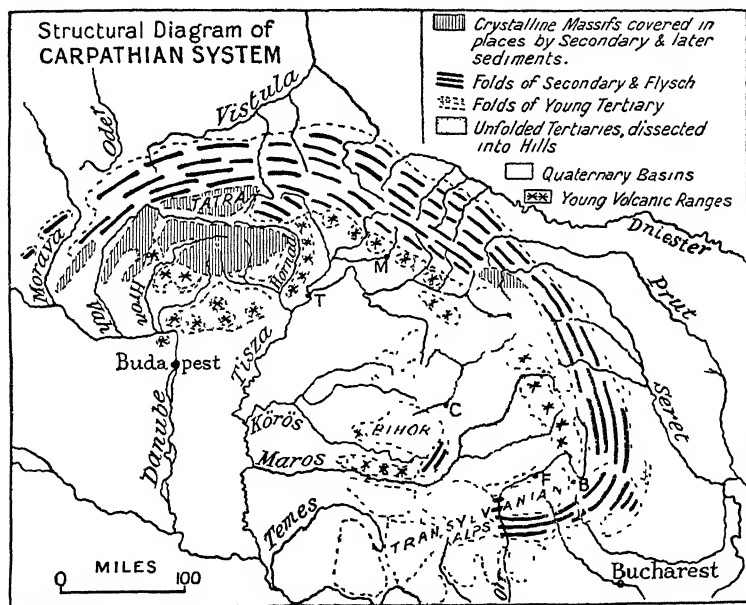
To a certain degree the Carpathians may be considered to be a prolongation of the north-eastern Alps, though the longitudinal zones do not correspond very closely and the *nappes* or *decken* are much less developed. One of the peculiarities of the Carpathian system is the great amount of block subsidence on the inner side of the mountain arc. The Hungarian basin almost divides the arc into two sections near the headwaters of the Tisza, and lesser subsidences are numerous. The subsidences were usually accompanied by volcanic outpourings of Tertiary age.

It is usual to subdivide the Carpathians into four sections according to structure and physical characteristics. The Western Carpathians stretch from the Vienna basin to the River Hornad, the Central Carpathians comprise the narrow stretch between the latter river and the upper Tisza, the Eastern Carpathians continue almost as far as Braşov (Ger., Kronstadt), and the Southern Carpathians or Transylvanian Alps continue as far as the Iron Gate on the Danube. The Transylvanian basin with its western mountain edge is sometimes included as a fifth division. (See Fig. 116.)

There is no single longitudinal zone that continues throughout the whole length of the chain, though an outer sandstone or Flysch zone is present everywhere except in the Transylvanian Alps. Also

a foreland of lightly folded Tertiary material is almost complete. An inner zone of crystalline rock is well represented in the Western Carpathians, disappears in the Central Carpathians, reappears as a narrow band in the eastern section, and forms the core of the Transylvanian Alps.

The Western Carpathians. This section of the Carpathians differs in many ways from the rest of the mountain chain. The chain is here at its widest, highest, and most complex. At the same time it is deeply penetrated by longitudinal rivers, such as the Vah (Ger., Waag), Hron (Ger., Gran), and Hornad (Ger., Hernad),



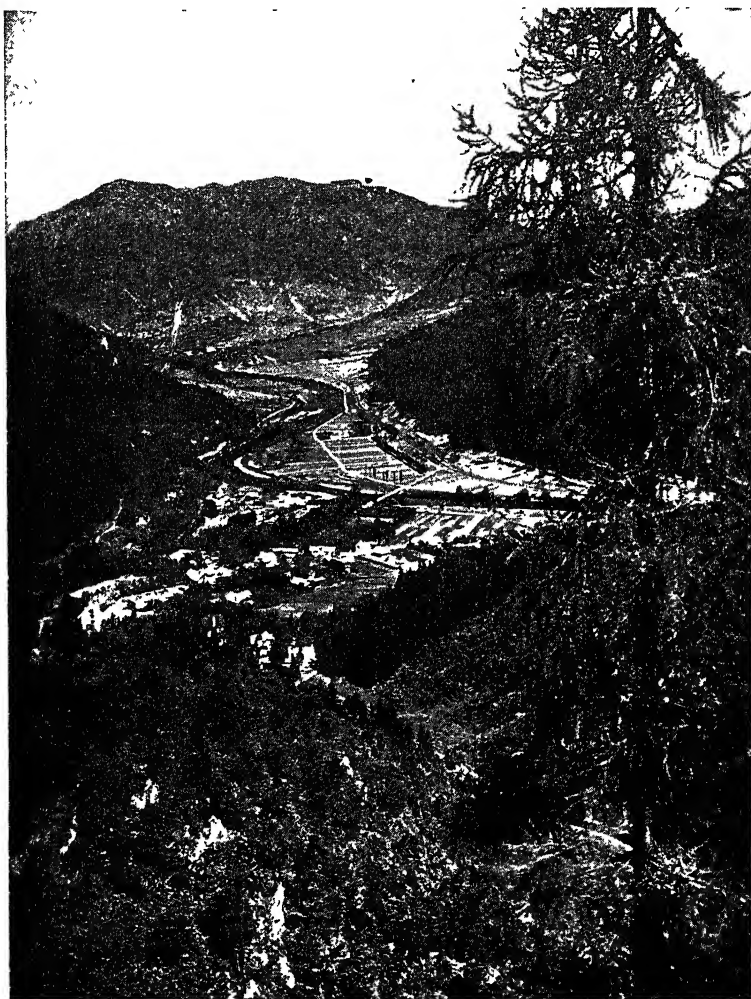
[After de Martonne

FIG 116.—STRUCTURAL DIAGRAM OF CARPATHIAN SYSTEM.

which flow towards the Pannonian basin, and it is studded also with numerous tectonic basins. Internal movement is therefore relatively easy and the region is fairly well penetrated by railway lines.

The Carpathians consist here of a series of structural zones which are concave to the south, with the exception of the most southerly one. The zones are not very easily distinguished from each other on the relief map, as they are only occasionally separated by well-marked depressions; moreover, the nomenclature offers difficulties owing to the existence of three sets of names (*i.e.* Slovakian,

Hungarian, German) for most of the physical features and human settlements. The zones may be termed briefly the northern, central,



[Courtesy Czechoslovak Legation]

FIG. 117.—LUBOCHŇA ON THE UPPER VAH, SLOVAKIA.

One of the valleys which penetrate deeply into the Western Carpathians.

and southern, the first consisting mainly of rocks of Mesozoic age, the second mainly of ancient crystalline material often covered

by Palæozoic and Mesozoic sediments (frequently of metamorphic character), and the third of young volcanic rock.

The northern or outer zone belongs to the *Flysch nappe*, which consists largely of sandstone. It forms a long range of hills and mountains, generally forested and of rounded form, which are known here under the name of Western Beskids. The range seldom exceeds 4,000 feet in height and is fairly easily crossed; indeed, the name Beskid is said to mean "passes." The Jablunkov Pass (1,808 feet), the pass north of Zakopane and the Dukla Pass (1,653 feet) are all followed by railways. Separating the northern zone



[Courtesy Polish Press Bureau]

FIG 118.—THE PEAK OF KOSCIELEC IN THE HIGH TATRA.
The marks of glaciation are apparent.

from the central zone there is a fairly well marked line of depressions developed in soft marls, but not occupied by any master river.

The central zone follows the same general curve as the Beskids, but comprises much more varied material. This central zone has also been called the crystalline zone, but actually crystalline rocks as a rule appear at the surface only in the higher mountain masses, such as the Tatra, and are more often concealed beneath later sediments. The zone is divided into outer and inner ranges, only clearly separated from each other in the region of the Liptov-Poprad depression in the valleys of the upper Vah and Poprad. In the outer zone the Mala Fatra and High Tatra Mountains are included among the best known ranges. The latter reaches a height of 8,737 feet and is the highest and most picturesque range of the whole

Carpathian system. It is composed of resistant granites and received abundant glaciation during the great Ice Age and now shows the typical pyramid-shaped peaks, cirques, arêtes, lakes, waterfalls, and so on, similar to those of the High Alps. The apparent height is enhanced by the surrounding basins, above which the range towers in majestic fashion. A number of tourist centres are to be found here, *e.g.* Zakopane (in Poland). The Polish frontier bends south in this region to include part of the northern side of the Tatra Mountains. The inner line of the central zone includes the Velka or Great Fatra and the Lower Tatra as its best known ranges. These are composed largely of granite and gneiss, with an envelope of Triassic limestone, while east of the Lower Tatra and south of the Hornad are the Spiš Ore Mountains. These are composed of Palæozoic schists with ancient volcanic intrusions associated with mineral ores, particularly iron, though the iron industry established here in the Middle Ages by German settlers is now moribund. Iron deposits are also found in the crystalline massif south of the upper Hron. Finally, the Slovakian Karst composed of Triassic limestone adjoins the Pannonian basin north of the Sajo (Sl., Slaná) depression.

The third, or southern, zone of the Western Carpathians consists of young volcanic material and is very discontinuous. The largest section lies athwart the middle Hron, and is often known as the Slovakian (formerly Hungarian) Ore Mountains. Small deposits of gold, silver, and copper occur and attracted German miners in mediæval times to places such as Schemnitz (Sl., Banská Štiavnica), though the ores are now unprofitable to work.

South of the Ore Mountains and Karst lies a well-marked depression filled with Tertiary and Quaternary deposits and studded with young volcanic material. The Ipel (Ger., Eipel) and Sajo utilise part of this depression, which separates the Western Carpathians proper from the volcanic Mátra and partially volcanic Bükk (=“beech”) hills of Hungary.

To the east of the central crystalline zone occurs a broad faulted depression which can be traced by the north-south section of the Hornad River. The Torysa valley continues the route northwards almost as far as the River Poprad, which cuts transversely through the Flysch zone, so that a through route is offered between the plains of Hungary and Poland, with the longitudinal valleys of the Western Carpathians opening into it. Košice (Hung., Kassa; 70,000), the most important town of the region, is to be found on this route. East of the Hornad fault lies a long line of volcanic hills, running north and south between the Hornad depression and the great bay of lowland that bites into the Central Carpathians.

Tokaj, celebrated for its wine, lies at the southern end where these hills reach the Tisza.

The Central or Forest Carpathians. Here the width of the mountains is reduced to about sixty miles only. The mean height is much lower than elsewhere and several low passes, *e.g.* Dukla, Lupkov, Jablonica, connect the Hungarian plain with the upper Dniester corridor and the plateau of Podolia, formerly Polish, now part of the U.S.S.R.

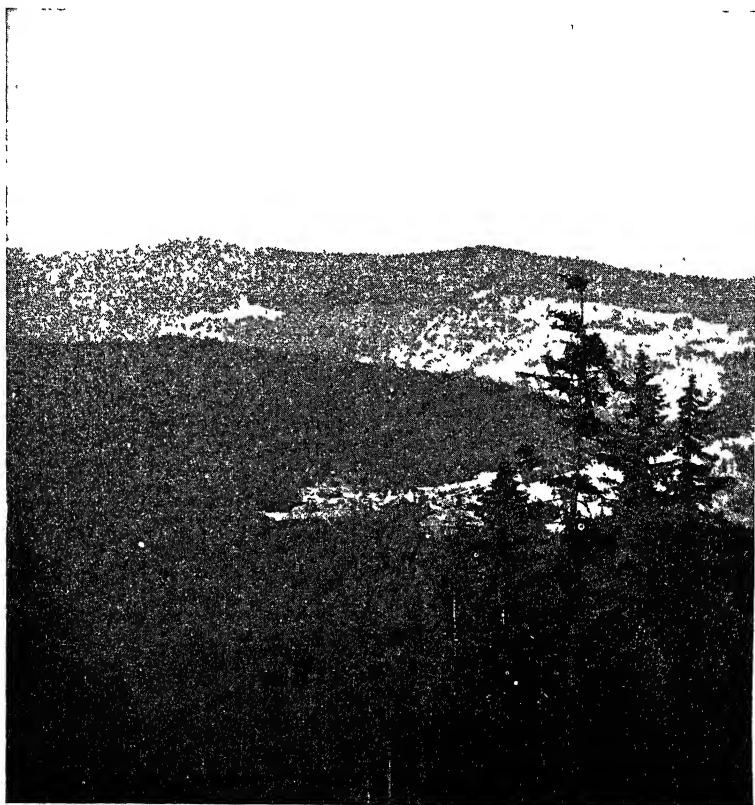
Only the Flysch zone is to be found here, known generally as the Eastern Beskids, accompanied by an inner line of young volcanic hills. Deposits of oil are found in the foot-hills on the northern side and worked mainly near Boryslaw, and deposits of salt in the plains on the southern side.

Human Geography. Apart from the Tatra and Fatra groups the mountains are generally forested to the summits. The broad basins and valleys are well cultivated, especially those opening southwards. The mountains are occupied almost entirely by people of Slavonic speech, Poles in the Western Beskids, Slovaks farther south, and Ruthenians on either side of the Central Carpathians. Ruthenia, which formed the most easterly section of Czechoslovakia after 1918, is now in the U.S.S.R. Germans, descendants of the ore miners, are to be found mainly in the Spiš (Ger., Zips) district and in the Slovakian Ore Mountains. The Slavonic inhabitants, especially the Ruthenians, may be regarded as backward in comparison with the people of north-western Europe. The wearing of local costumes and the picturesque but primitive small towns reveal the cultural isolation of the region in spite of the physical ease of penetration *via* the valleys.

The Eastern Carpathians. The Eastern Carpathians stretch from the source of the Tisza almost as far round as Braşov, and are situated mainly in Romania. Apart from the foreland they consist of three main zones. The outer, or easterly, zone is composed of parallel ridges of Flysch (sandstones with some conglomerates); the central zone of crystalline schists is accompanied in places by resistant limestones of Mesozoic age; the inner, or western, zone is mainly of young volcanic material. Both the Flysch and the crystalline schists are relatively easily weathered, and rounded forms are seen almost everywhere. Since the average height of the mountains is only about 5,000 feet they were little affected by glaciation, only a few higher summits being nibbled by cirques, *e.g.* the Rodna Massif, which attains 7,560 feet. The Eastern Carpathians are well forested, with deciduous trees, especially beech, on the lower slopes, and conifers on the upper slopes, and

they supply much timber, which is floated down the rivers, particularly those on the eastern, *i.e.* Moldavian, side. The upper limit of tree growth is here about 5,000 feet, and there is little high pasture, except where clearing has taken place to afford grazing for sheep.

Human habitation is scanty apart from a few longitudinal depressions, which appear as islands of settlement and cultivation



[Courtesy Romanian Legation

FIG. 119.—THE MOLDAVIAN CARPATHIANS. MT. CEAHLĂU, IN THE DISTANCE.

in a sea of forested mountains. In the north these depressions lie in wide, shallow, longitudinal valleys not yet reached by the present cycle of erosion, *e.g.* the Moldavian Bistrița above Vatra Dornei (Dorna Vatra on some maps); in the centre the depressions are former lake basins, while in the south they are of tectonic origin. The central basins of Gheorgheni and Ciuc lie between the central

crystalline zone and the western volcanic zone. The latter stretches southwards from the Borgo Pass, south-west of Vatra Dornei, and is divided into the Căliman (Hung., Kelemen) Mountains north of the River Mureș (Hung., Maros), and the Giurgiu and the Harghitei Mountains farther south. These volcanic mountains apparently dammed back the drainage flowing westwards from the crystalline zone and produced lake-basins which are now the fertile, sheltered, and well-cultivated basins of Gheorgheni, drained by the upper Mureș, and Ciuc, drained by the upper Olt.

Two other basins of similar appearance but of tectonic origin lie farther south in the angle between the Eastern Carpathians, here represented only by the Flysch zone, and the Transylvanian Alps. These are the basins of Trei Scaune¹ (Hung., Három Szek), and of Brașov. From the latter the Predeal Pass leads south, carrying the railway line from Budapest to Bucharest. The Eastern Carpathians themselves are crossed by several single-track railways but by no main railway line, partly, no doubt, owing to the backward state of economic development of the lands east of them.

The Eastern Carpathians are mainly inhabited by Romanian-speaking people, but two other linguistic groups are represented. To the north of the crystalline Rodna Massif, which quite anomalously runs from west to east, the people are Ruthenian-(Ukrainian) speaking, in the region known as Maramureș. This area was Hungarian before 1918, subsequently Romanian, and is now in the U.S.S.R. To the east of Maramureș lies Bucovina ("beech-land"), which was ceded by the Turks to Austria in 1775, and became Romanian in 1918. During the comparatively prosperous years of Austrian rule, considerable numbers of Ruthenians and Russians entered northern Bucovina, with the result that the northern counties of this province have now come under the U.S.S.R.

Three of the intermontane depressions (those of Gheorgheni, Ciuc, and Trei Scaune) are inhabited by Magyar-speaking people, called Székely, though they are better known by the German version of their name, *i.e.* Szeklers.

The Southern Carpathians. The Transylvanian Alps are not, in fact, very Alpine in appearance, though like the Western Carpathians they contain certain massifs which show well-marked pyramidal forms and other results of glaciation. In the main they are sufficiently high for their summits to rise above the forest zone and they generally present fine scenery.

Structurally the Southern Carpathians belong to the so-called "central" zone, but here all the other zones are lacking except the

¹ The name means "three seats" or "settlements" in both languages.

foreland. The rocks composing the mountain chain have been acutely folded as in the case of the Alps, but the present topography rests upon a later sequence of events. At least three periods of extensive peneplanation and rejuvenation have been traced. The Transylvanian Alps exhibit accordingly three series of flat-topped plateaus or platforms at different levels corresponding to the different periods of peneplanation. True Alpine forms occur only where occasional monadnocks were left standing above the level of the highest platform, otherwise the highest level is but slightly fretted by cirques and gives an Alpine appearance only from below. Most platforms or *plaiuri*, a Romanian word meaning "paths," are on the middle and lower peneplain surfaces. The real Vulcan Pass is not the wild gorge of the River Jiu, but lies on one of the *plaiuri* frequented by shepherds and used at least as far back as Roman times, though the modern route is carried along the gorge of the river. There is much pasture on the platforms of the middle and lower levels and this is utilised by sheep during the summer months. Before the coming of winter, during which season the mountains are under heavy snow, the sheep are driven down to the lowlands.

The Southern Carpathians become lower towards the south-west and change to a north-south direction under the name of the Banat Mountains. Some geographers consider the Banat Mountains to begin west of the River Jiu, but it seems better to reserve the name for the mountains west of the River Temeş where the height is less and the structure different. Here sedimentary rocks of Palæozoic and Mesozoic age appear as well as the crystalline. In the Banat Mountains occur deposits of coal (Anina basin), and iron (near Reşiţa), which have given rise to relatively important metallurgical and engineering industries at Reşiţa.

The Bihor Massif and its neighbouring mountains, which are known collectively as the Apuseni (*i.e.* "western") Mountains in Romania, almost shut off the Transylvanian basin on its western side from the lower-lying Hungarian basin, without, however, preventing the rivers of the Transylvanian basin from finding their way westward to join the Tisza in the Hungarian plain. This massif consists of very varied material and is of somewhat doubtful tectonic origin, though it is considered by some writers to be connected with the ancient Rhodope system. It consists partly of ancient crystalline rocks, partly of Palæozoic and Mesozoic sediments of various kinds, together with recent volcanic material. The whole mass has been greatly faulted and is much penetrated by faulted basins. With its meadow platforms and forested slopes its economic life is similar to that of the Transylvanian Alps.

The Transylvanian Basin. This basin lies at a height of 1,500 to 2,000 feet above sea-level. It is composed of almost undisturbed sediments of Tertiary age such as underlie the recent deposits of



[Courtesy Romanian Legation]

FIG. 120.—THE FERTILE BRAȘOV BASIN, TRANSYLVANIA.

The view shows the compact village of Rășnov, highly cultivated land beyond, and the Transylvanian Alps in the distance.

the Hungarian basin. Owing to the continued sinking of the latter basin, most of the drainage of the Transylvanian basin goes westwards, and the relative height of the two basins causes erosion to be active in the higher one, so that the Tertiary sediments of the

Transylvanian basin have been dissected to form a hilly country. The rounded summits of these hills separate broad valleys, which are often accompanied by softly outlined terraces. The clays and sandstones of this area rarely cause any sharp declivities but lend themselves to the development of smooth and gentle curves. Round the margin of the basin, particularly in the south and east, are a number of small flat-bottomed basins of special fertility, such as those of Sibiu (Ger., Hermannstadt) and Făgăraș, and those already mentioned, *i.e.* Brașov, Trei Scaune, Ciuc, and Gheorgheni, though these are more properly intermontane.

The peculiar manner in which the River Olt breaks through the



[Courtesy Romanian Legation]

FIG 121.—SIGHIȘOARA IN CENTRAL TRANSYLVANIA.

Formerly known as Segesvár (Hungarian) or Schassburg (German), it is typical of many small Transylvanian towns founded by German settlers in the Middle Ages

lofty Transylvanian Alps is noteworthy. This represents a beautiful example of river capture which took place when the land north of the mountains stood at a higher level than at present. The resultant gorge is known as the Red Tower Pass and is followed by a railway.

The climate of the Transylvanian basin is markedly Continental, with hot summers and cold winters, but is not so extreme as that of the Hungarian basin, while the precipitation is heavier, owing to the greater altitude. The area was originally a wooded country and not a grassland. Owing to the combination of favourable soil and climate most of the region has been cleared for cultivation, with maize and wheat as the leading cereals, with some orchard land

and many vineyards. A good deal of pasture land is also to be found, so that the area is one of mixed farming. It was particularly favourable to early man, as it offered a great variety of resources in a small area, and defensive sites in addition.

Considerable mineral deposits are to be found. Salt in many localities, natural gas in the interior, some lignite on the southern border, and small deposits of iron-ore in the south-west. Small deposits of gold have long been worked in the Apuseni mountains, but the industry is now at a standstill.

Almost all the towns were originally German foundations, many being built to guard vulnerable passes across the encircling mountains, e.g. Braşov (Ger., Kronstadt; about 85,000¹) at the northern end of the Predeal and Bran Passes, Sibiu (Ger., Hermannstadt; about 64,000), at the northern end of the Red Tower Pass. Cluj (Mag., Kolozsvár; Ger., Klausenburg; about 111,000), the largest town, is situated on the main road and railway connecting Budapest and Bucharest, and is well placed in regard to communications over the whole of the basin and with the Hungarian plain. Its name means "gorge" in all three languages. In addition to being market centres, some of the towns have manufactures, e.g. Sibiu and Braşov have small but historic textile industries, while Dicio Sântmartin and other smaller centres have modern chemical factories, making caustic soda and similar products, using local salt and natural gas.

The mountain rampart served in defending Transylvania against the Turks, so that for long it was the most eastern outpost of West-European civilisation. The natural beauty of Transylvania, its mediæval towns, its picturesque inhabitants, and its unspoiled countryside combine to present a scene of strange enchantment.

REFERENCES

Bau und Bild der Karpaten, by B. Uhlig (Vienna and Leipzig, 1903), is the standard work, now somewhat out of date. See also "The Carpathians," by E. de Martonne (*Geog. Rev.*, Vol. 3, 1917), and relevant chapters in *Landeskunde der Sudeten und West-Karpatenländer*, by F. Machatschek (Stuttgart, 1927), and in *Europe Centrale* (2 vols.) by E. de Martonne (1930 and 1931).

¹Population figures are estimates for 1945.

CHAPTER XXIX

THE ROMANIAN LOWLANDS

(1) **The Walachian Plain.** This region has much physical similarity to the Hungarian lowlands, but on the whole it is hotter and more arid, especially as compared with the northern part of the Alföld. In some ways it is more monotonous, as there are fewer trees and also fewer signs of habitation, and those with few exceptions poor and mean. Its Tertiary sediments are covered by a thick mantle of recent deposits derived from the wastage of the Transylvanian Alps. There is a top-dressing of löss, especially east of the River Olt, and considerable stretches of sand west of that river. The Walachian lowland is separated from the Bulgarian bank of the Danube not only by the main stream of that river, but by its flood plain (known as the *Balta*), a band of swampy country, some six to nine miles wide, studded with lagoons and with deserted arms of the river. There are cliffs bordering the flood plain on either hand, and although those on the Bulgarian side are higher, rising some 300 feet above the swamps, and come closer to the river, those on the left bank remind us that the Romanian plain is structurally just as much a plateau as the Bulgarian "platform," though it is lower and covered by younger deposits. Indeed, the two regions of the Walachian plain and the Bulgarian platform or foreland are not unlike each other in soil, climate, and products, but the Danube acts as a very real barrier between them owing to the difficulty of building a bridge across the broad river and its broader swamps, or of finding a landing-place for a ferry on the northern side. Only one bridge, that at Cernavoda, crosses the Danube in the 660 miles of the Romanian section, though there is a car ferry at Giurgiu.

From the cliff bordering the swamps and flood plains of the Danube, a series of broad terraces rise by very gentle stages until the foot-hills are reached, roughly at a height of 600 feet, and in turn the foot-hill zone rises until the mountains themselves are attained.

The rivers have mostly incised their beds, and though even those from the mountains contain little water in summer and those from the foot-hills mainly dry up completely, yet the valleys are cut down sufficiently near the water-table for water to be procurable at no great depth, and in the deeper valleys springs occur along the sides.

In August and September, however, the water shortage is acute, even at such a town as Craiova, in spite of the fact that it is situated close by the River Jiu, one of Walachia's principal rivers, and *before* the river crosses the plain.

Exposed to biting north-east winds in winter and blistering heat in summer, the treeless and waterless plain caused great hardship to the colonists who came from the foot-hills to people the plain in the nineteenth century. Population is not dispersed here, but concentrated where water is available. In reality, the plain is more suited to large-scale than to peasant-farming, and in spite of the distribution of land among the peasants in accordance with the Agrarian reforms in and after 1917, large holdings were still common here, at least down to 1945. They could be distinguished from the long, narrow strips of peasant cultivation by the big square fields, by the use of the tractors, and other machinery, or even from the fact that harrows and rollers were often drawn by a pair of fine large horses which would not look amiss in England, whereas the peasants use oxen for work in the fields, and their horses are mere ponies. Most of the wheat export of Romania comes from these plains and those beyond the Siret River, though the quantity is much reduced compared with pre-1914 days, as the peasants prefer to grow maize, a crop of which they have more knowledge and which forms their staple food. Communications across the plain are poor; even the main trunk road which skirts the foot-hills is not tarred, and its uneven surface makes motor travel painful. Other roads are dirt roads suited only to country carts. There is nothing here to compare with the fine new "international" road, which runs from Oradea through Transylvania *via* Braşov to Bucharest.

In Oltenia, to the west of the River Olt, the land is higher, with rather more than half the region between the mountains and the Danube occupied by foot-hills which send long narrow fingers southwards, so that it is difficult to say where the foot-hill zone ends and the plain begins. The steppe-lands here are themselves less steppe-like, and have more variety of relief, a heavier rainfall, more numerous springs, and a more diversified agriculture.

The most favourable portion of the Walachian plain is that in which Bucharest was built. This region, known as the Vlăşia district, extends all the way from the foot-hills region near Ploeşti to the Danube, in the region where it is joined by the River Argeş. Here are precisely those supplies of water and woodland which are generally lacking elsewhere on the plain. The two main rivers, Argeş and Dâmboviţa,¹ come from the high mountains and contain

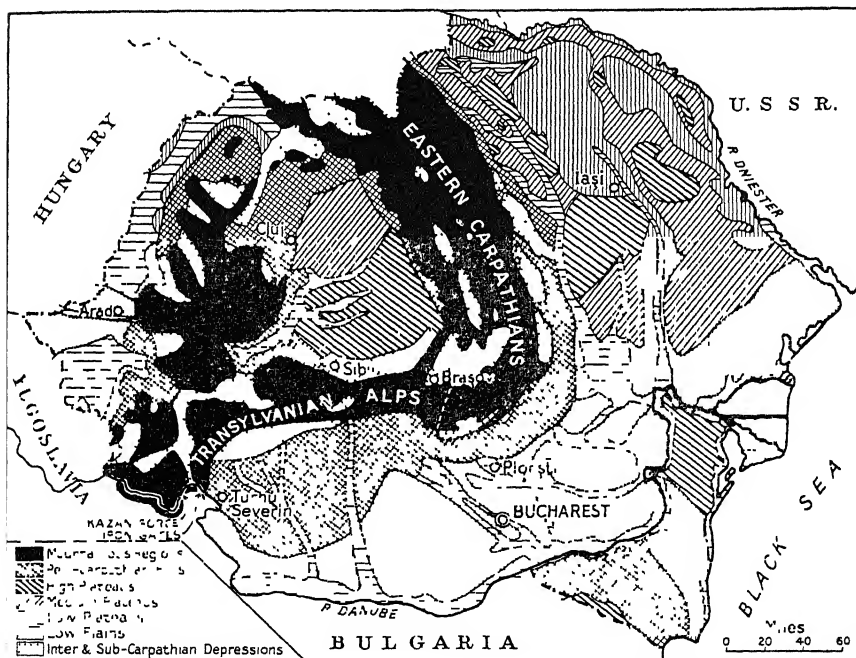
¹Pronounced *Dimbovitsa*.

water even in summer, and though the Dâmbovița where it runs through Bucharest is hardly more than an insignificant ditch and is now partly carried underground, yet this is not all the water which it has brought from the mountains, for it sends off several laterals or distributaries higher up. It seems that the erosion gradient in this region is less now than formerly; in any case, the water-table is near the surface, and it is noteworthy that the little River Mostiștea east of Bucharest rises right in the middle of the plain. Nor have the rivers incised their beds to any extent, the Dâmbovița, Colentina, and Mostiștea being all nearly level with the plain. The fact that the water-table is near the surface means that trees will grow easily and considerable patches of natural woodland still remain. In addition to these local advantages the region also had the advantage of lying on the overland route between Constantinople and Transylvania, *via* the Bran Pass at the head of the Dâmbovița and the old Danube crossing at Giurgiu. Along this route was an active exchange of goods between the Orient and central Europe.

Bucharest. The actual site of the city was perhaps selected because of two small steep hills, on one of which now stands the Metropolitan Church and the Parliament House. The town came to be the princely residence from 1460 onwards and flourished as a market place. In 1640 it already had a population of 100,000, but the numbers declined and did not again reach this figure for nearly two hundred years, its growth being hindered by plunderings, burnings, and epidemics. The end of the eighteenth century saw an oriental-looking town with an extraordinarily cosmopolitan population: Greek, Armenian, Albanian, Bulgarian, Italian, Hungarian, German, Turkish, Jewish, in addition to the Romanian element. A new era began after the Russo-Turkish wars at the end of the eighteenth century, and the city grew with the expansion of the state. With only 121,000 inhabitants in 1860, by 1912 it numbered 341,000, and in 1945 some 985,000. The city had lost its oriental character by the beginning of the present century, but the greatest changes in its appearance have taken place since 1918. Rebuilding was still in progress on every hand in 1938, and the city gave an impression not only of bustling life such as one might expect in a capital city, but also of beauty, orderliness, grace and cleanliness, which was perhaps unexpected from descriptions written before, say, 1920. The administrative, commercial and cultural interests of Romania are all concentrated, perhaps over-concentrated, in Bucharest. There are also a number of industries such as flour-milling, brewing, brick-making, machine-repairing, and some machine-manufacturing, oil refining, rubber manufactures and clothing industries, etc.

Apart from Bucharest there are no towns in the midst of the plain. All the others are on the margins, either near the foot-hills or along the Danube.

The position of the two chief Danubian ports, Galatz (Rom., Galați; 93,000⁴) and Brăila (97,000), strikes the eye as curious, in that they are only nine miles apart. Actually they were originally rival ports, the first being in the principality of Moldavia and the latter in the principality of Walachia before the union of the two in 1859. Each stands on a piece of firm ground that approaches the



[After Pelham and Mihăilescu]

FIG. 122.—MORPHOLOGICAL DIAGRAM OF ROMANIA (1938 FRONTIERS).

river on the northern side, but both are losing trade to Constanța (80,000) on the Black Sea coast.

The population of the Walachian plain is entirely Romanian and was settled from the foot-hills of the north, mainly in the nineteenth century.

(2) **The Romanian Foot-hills.** These form a fairly narrow band of country in Moldavia and also in Walachia as far west as the Dâmbovită district. The folded Tertiaries of this eastern section

¹ Population figures are estimates for 1945.

contain important deposits of petroleum in the Prahova and the Dâmbovița districts. Large deposits of salt are worked near Slănic and less important amounts of salt and petroleum in the Bacău district of Moldavia. West of the Dâmbovița, a region of rather similar aspect but of different structure stretches out in front of the Carpathians, and is separated from them by the sub-Carpathian tectonic depression. In these western foot-hills the deposits are very little folded or faulted, but were raised bodily with the last elevation of the Carpathians, and have been since much dissected, so that deep valleys are sunk some 300 to 700 feet in the almost horizontal strata. The whole of the region of



[Courtesy Romanian Legation]

FIG 123.—VIEW IN THE MORENI OILFIELD, NORTH-WEST OF PLOEȘTI.

the foot-hills is a land of ancient settlements, smiling villages, old monasteries, and a fairly dense population with an active subsistence agriculture. Forested or wooded uplands usually separate the valleys from each other. Small holdings and a great diversity of crops are the rule. Fruit trees, especially plums, are abundant and the vine is widely grown. The population is more widely dispersed than in the plain. The most favoured zone of the foot-hills is the sub-Carpathian depression, which may be regarded as the cradle of Romanian nationality. At the outer edge of the foot-hills, standing on the plain, are a number of market towns, of which Craiova (75,000), Slatina, Ploesti (105,000), and Buzău are the most important. Ploesti is also the centre of the

oil-refining industry. The output of petroleum in 1937 was 7.1 million tons, against 1.9 million tons in 1913, but it represented only about 4 per cent. of the world's total output.

(3) **The Moldavian Platform.** From the foot-hills of the Eastern or Moldavian Carpathians begins the great East-European or "Russian" platform, stretching away towards the east, through Moldavia and Bessarabia. (The latter province was originally part of the principality of Moldavia, but was ceded by its Turkish suzerain to Russia in 1812, reverted to Romania in 1918, and passed to the U.S.S.R. in 1945.)

The Moldavian section of the platform lies between the marshy



[Courtesy Romanian Legation]

FIG. 124.—PETROLEUM REFINERY AND STORAGES, PLOESTI.

Note the development of the petroleum industry in the midst of a purely agricultural landscape.

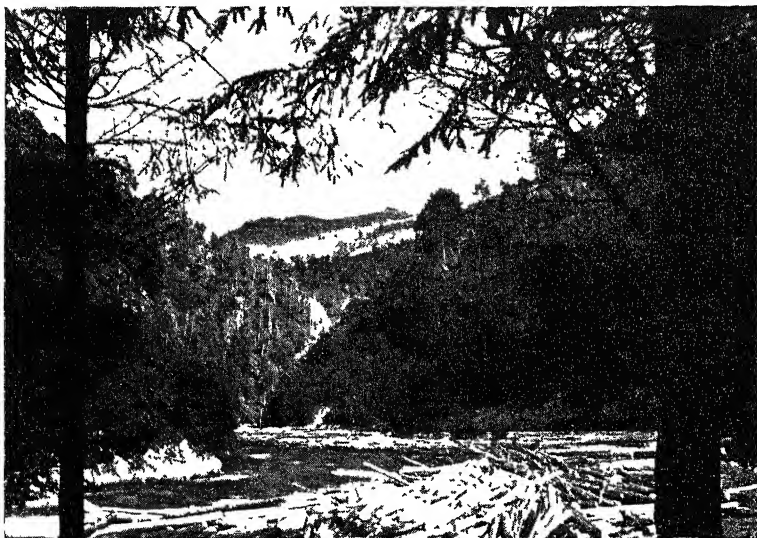
flood-plains of the River Siret on the west and the Prut on the east, and is developed on slightly tilted, but otherwise little disturbed sedimentary rocks of Tertiary age. The region is, however, by no means flat, especially in the central portion, where heights of over 1,300 feet are found. In relief, eastern Moldavia falls naturally into three regions; a northern lowland, a central dissected plateau, and a southern plain. The northern lowland is built up of layers of sandstones and clays which have been weathered into rounded, broad-backed hills, though on the west, overlooking the River Siret, the land is higher and more plateau-like. The whole region, except for this plateau, is a hilly steppe,

though valleys tend to be water-logged in spring when the snow melts, and two or three of the more important valleys which have been cut down to the clay, are marshy for the greater part of the year. The hills are mainly löss-covered and the soils mainly *chernozem*, which are, of course, excellent for grain, but the region is liable to disastrous droughts. Except in the extreme west the landscape is singularly naked-looking, and the little villages appear bare and miserable, without trees to protect them from the biting blizzards of winter and the blistering heat of summer. This lowland continues as far south as Iași, where it is overlooked by the great limestone scarp, which runs from east to west, and marks the northern edge of the central plateau. The higher northern part of the plateau has been protected to some extent from erosion by a thick capping of Tertiary (Sarmatian=late Miocene) limestone, though the rivers have cut deep, steep-sided valleys (*cf.* the English Cotswolds or the French Plateau de Langres). Farther south, the limestone sinks beneath layers of sandstones, gravels, and clays, and the landscape has softer forms. The whole plateau region recalls the foot-hills of Walachia, both in physical appearance and in human geography. Woods and pastures cover the heights, the less steep slopes are cultivated, the moist valleys are devoted to meadows or to crops of maize; vineyards are common. The villages lie among orchards in the shelter of the valleys. The plateau is a region of ancient Romanian settlement, and so also are the terraces bordering the Siret and Prut flood-plains. The plateau sends fingers of upland southward (as in Oltenia), so it is difficult to say where the upland ends and the southern plain begins. South of Bârlad, however, the land is almost flat, trees are very rare, water is scanty, and löss becomes increasingly prevalent until the real Black Earth is reached. The treeless steppe is devoted to cereal growing as in northern Moldavia.

Eastern Moldavia is undeveloped economically, with few railways, no good roads, and few towns. Iași (109,000) is the capital and largest town.

(4) **The Dobruja.** Romania's trans-Danubian province is a treeless penplain, whose löss-covered surface conceals a layer of unfolded chalk. This again conceals folded rock of an earlier age, although in the higher lands of the north the old folded strata appear at the surface. Owing to the chalk formation underlying the löss the region is particularly lacking in surface streams, but it is seamed by *wadis*, especially in the middle portion where the arid plateau looks like a slice of Africa. The Dobruja (Rom., Dobrojea) falls abruptly both to the Black Sea coast and to the Danube. It undoubtedly accounts for the northward bend of the Danube,

which once more turns east at Galatz when freed from this natural embankment. The greater part of the Dobruja is now under the plough, though yields tend to be low. The northern hills still carry some tree growth. The only town of any size is Constanța, though a number of charming seaside resorts have lately been developed here, *e.g.* Mamaia. The modern port of Constanța is artificial, but is of great and growing importance to Romania, as it is practically ice-free. An oil pipe-line connects it with Ploiești.



[Courtesy Romanian Legation]

FIG. 125.—THE TIMBER INDUSTRY IN THE CARPATHIANS.

Many of the Carpathian rivers are used for floating logs down to the timberless plains. The mountain shown above the forests is part of the Paringu massif in the Transylvanian Alps.

The southern part of the Dobruja, which was obtained from Bulgaria in 1913, reverted to the latter country in 1945.

(5) **Lowlands in the Pannonian Plain.** Because the eastern fringe of the Pannonian Plain was mainly inhabited by Romanians, who seeped down here from the mountains during the eighteenth and nineteenth centuries, it came under Romanian rule at the break-up of the Austro-Hungarian empire in 1918. This fringe consists for the most part of fertile agricultural land, growing wheat, maize, sugar-beet, tobacco, fodder crops, and carrying considerable numbers of livestock, including cattle, pigs, and geese. In former days the rivers flooded far and wide, but the marshes were largely

reclaimed in the nineteenth and early twentieth centuries, though the drained soil unfortunately frequently developed alkali patches. A number of medium-sized towns served as exchange points for the products of the plain with those (chiefly timber) of Transylvania. Such towns are Oradea (93,000), on the "Rapid" Criş (Crişul Repede), Satu Mare (52,000) on the Someş, Arad (83,000) on the Mureş, and Timișoara (better known as Temesvar; 108,000) on the canalised River Bega.

Romania. The State of Romania has grown in a remarkable fashion since 1859. In that year the two Romanian-speaking principalities of Walachia and Moldavia united, and from that year dates the beginning of the westernisation of the country. Up to that time the country had been under Byzantine, Turkish, and Russian influences, and the whole region was in an extremely backward condition. The first bank, founded as late as 1857, was a failure, and the first railway was not opened until 1869. The combined principalities attained the rank of kingdom in 1881, the bulk of the Dobruja having been gained in 1878. In 1918, the addition of Transylvania, the eastern section of the Pannonian plain, Bucovina, and Bessarabia doubled the area of Romania and almost doubled the population, though rendering it less homogeneous. In 1930, of the 18 million inhabitants, some $1\frac{1}{2}$ millions were Magyars together with Szeklers, 1.1 millions Ukrainians, 757,000 Jews, and 400,000 Germans.

The Romanians claimed to be descended from the colonists and Romanised inhabitants of the Roman province of Dacia, and repudiated Slavonic association, though undoubtedly there has been considerable intermixture with the Slavonic-speaking peoples. The language has a Latin basis and the country looked to the Romance-speaking peoples for support and guidance, though by religion the people belong to the Greek Orthodox and the Uniat Churches.

The country is overwhelmingly agricultural. Over 80 per cent. of the people live on farms. Following the agricultural reform laws of 1917, large estates were broken up to satisfy the land hunger on the part of the peasants, and the amount of agricultural produce available for export somewhat decreased. There is little industrial development owing to the shortage of coal and iron, to historical backwardness, and to lack of capital, so that the country depends on its exports of petroleum, cereals, and timber for its ability to import the necessary manufactured goods. Wheat is the principal cereal exported, since maize is the staple food for home consumption. Romania may be looked upon as one of the granaries of Europe. Nevertheless, some progress had been made

towards industrialisation before World War II. Among those deserving mention are the refining of oil in the Ploești region, various chemical industries using Transylvanian natural gas, the scattered textile industry, the timber industry, the engineering industry of Reșița, and the cement industry. Bucharest carried on numerous secondary industries. The villages, however, still relied on their own handmade textiles, pottery, rugs, and farming implements.

REFERENCES

La Valachie, by E. de Martonne (Paris, 1902), is still the classic monograph on this region. Among the many books on the economic geography of Romania the following may be noted: *La Roumanie Economique de 1860 à 1915*, by G. D. Cioriceanu (Paris, 1928), and *Les Grands Ports de Roumanie* (Paris, 1928), by the same author. The *Atlas de l'Agriculture en Roumanie* (Bucharest, 1929) is worth consulting. For the human geography, *Eastern Carpathian Studies*, edited by H. J. Fleure and R. A. Pelham (London, 1936), *South Carpathian Studies*, edited by H. J. Fleure and E. Estyn Evans (London, 1939), and *Romanian Furrow*, a travel book by D. J. Hall (London, 1933), contain interesting material. The Bulletin of the Royal Romanian Geographical Society contains many interesting articles, often with French or German summaries.

CHAPTER XXX

THE BALKAN PENINSULA (I)

YUGOSLAVIA AND ALBANIA

OWING to its position and shape the Balkan peninsula is the least Mediterranean of the three southern peninsulas of Europe, though paradoxically it includes Greece, parts of which provide text-book examples of a Mediterranean country. The broad base which joins the peninsula to the rest of the continent not only allows the penetration of continental influences, but also the development in the northern and central areas of high pressure in winter and low pressure in summer, with the result that most of the peninsula has severe, snowy winters and hot, rainy summers, and thus the natural vegetation, agriculture, and the pattern of human geography generally are necessarily different from those of the other two southern peninsulas.

The Balkan peninsula is a region of even higher and more broken relief than either Iberia or Italy, being mainly above 1,200 feet with a large part over 3,000 feet. It lacks the level plateaus of central Iberia, and has nothing comparable to the Ebro basin or to the northern Italian plain. It lacks any considerable lowland to form a nucleus round which a really strong political state could be built up. The largest areas of lowland lie on the eastern periphery, in the very teeth of invasions from Asia. In fact the stormy history of the Balkan peninsula may be attributed very largely to a combination of unfavourable position and unfavourable relief, the former rendering it a conflict area of different types of civilisation, and the rugged relief rendering it a difficult area for political unification, human circulation, and profitable agriculture. Moreover, in place of the high mountain barriers which largely cut off each of the other two peninsulas from the rest of the continent, the Balkan peninsula lies open and exposed to the north. The five political units of the Balkan peninsula reflect its rôle of meeting place for different types of culture.

Both in structure and relief the Balkan peninsula is complex, though the broad outlines are deceptively simple. The build consists essentially of young folded mountains lying against the northern and western sides of an ancient crystalline massif (*see*

Fig. 3), generally known as the Rhodope (or Rodopi) block.¹ The massif, which represents the stumps of an old folded system, is composed mainly of crystalline schists, with considerable outcrops of granite, gabbro, and serpentine. Its north-west corner reaches nearly to Belgrade, its eastern corner almost to Constantinople

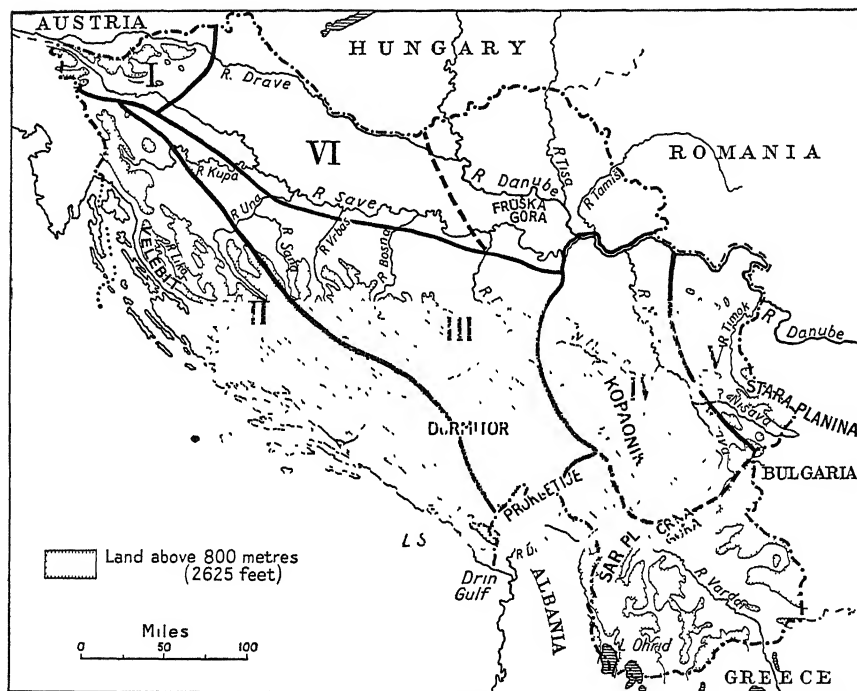


FIG. 126.—GEOGRAPHICAL REGIONS OF YUGOSLAVIA (1939 FRONTIERS).

- Key:
- I.—The Alpine Zone.
 - II.—The Western Dinaric Region, comprising the Karst and the Coastal Fringe.
 - III.—The Eastern Dinaric Region.
 - IV.—The Morava-Vardar Corridor Lands.
 - V.—The Balkan Mountains of North-East Serbia.
 - VI.—Yugoslav lands in the Pannonian Lowlands.

(Istanbul), and its southern corner to Salonika. Its south-western extension to the Gulf of Volos is sometimes known as the Pelagonian massif. Part of the massif has foundered beneath the Ægean Sea.

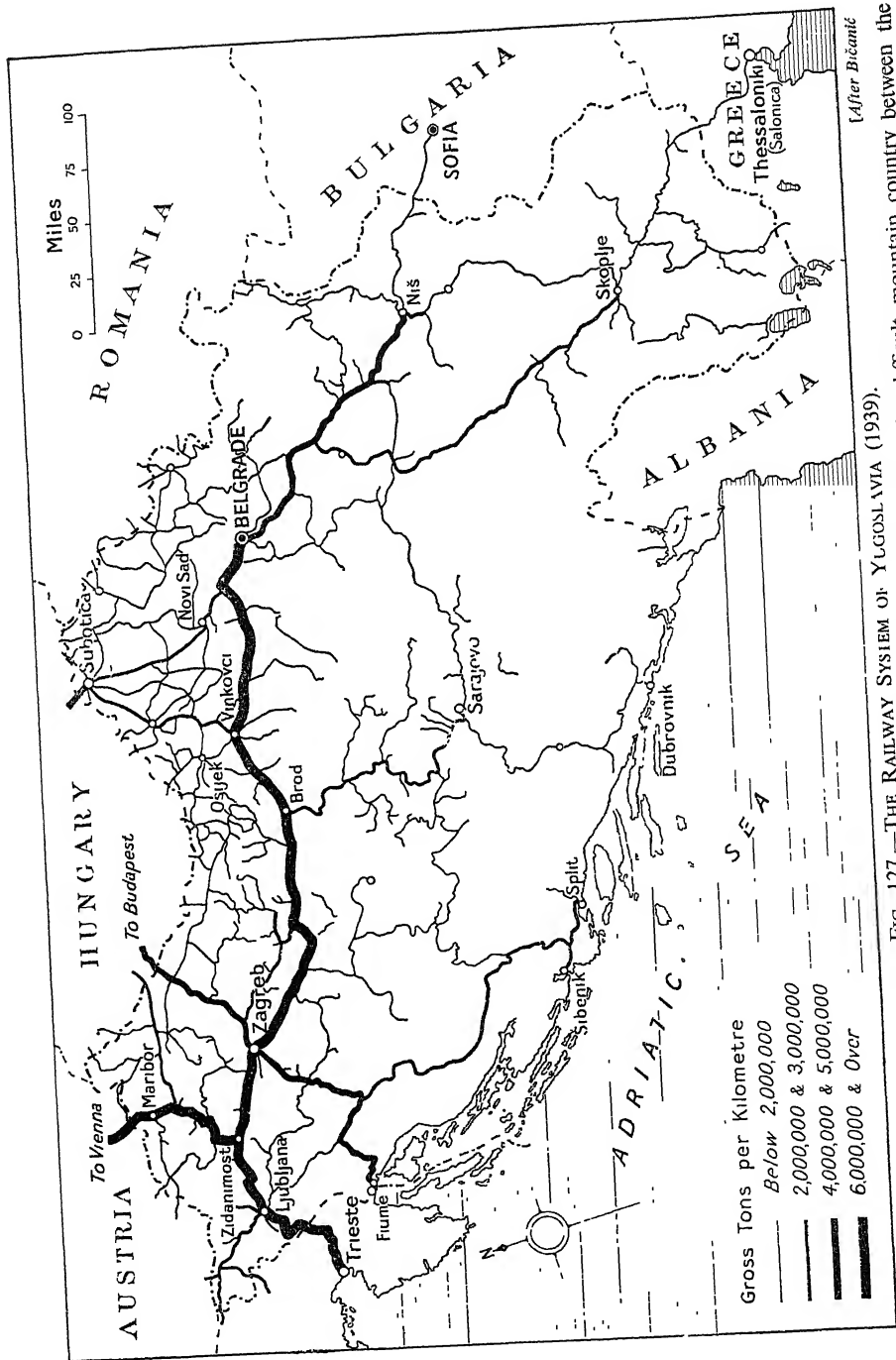
¹ The Rhodope Mountains proper, which lie in Bulgaria, form only a small portion of the massif.

The young folded mountains belong to two systems. On the north-east lie the Balkan folds (known in Bulgaria as the Stara Planina, *i.e.* "old mountains"), which appear to be a continuation of the Carpathian system. On the west lie the Dinaric folds, a much broader and longer range. The present relief is due not so much to the original tectonic movements as to subsequent events. By late Tertiary times the whole Balkan peninsula had been reduced to a peneplain, showing mature relief features, and with arms of the sea invading all low-lying parts. New earth movements, mainly epeirogenic, caused re-elevation of the greater part of the area at the close of Tertiary times. A good deal of faulting occurred, mainly in a north-west to south-east direction, but occasionally in an east to west direction, as along the western Morava River and the Gulf of Corinth. Warping or torsion seems to have taken place along the Adriatic coast, so that parts of the western Dinaric folds remained near sea-level. With the re-elevation a new cycle of erosion began, resulting, among other things, in the drainage of most of the area covered by seas and lakes, rejuvenation of the river system, much river-capture, and the development of gorges where hard rocks were encountered or where the streams were flowing across the grain of the country

THE WESTERN PART OF THE BALKAN PENINSULA

The Dinaric System. This system extends from the Ljubljana (Ger., Laibach) basin on the north to the southern tip of the Greek mainland. It is broadest in the north between the Gulf of Fiume and the Drin Gulf, where the trend lines are from north-west to south-east, and where also the distinctive feature of the Karst is widely developed. This high Karst desert offers, and has always offered, a great barrier to communication between the excellent harbours of the Dalmatian coast and the fruitful lands of Bosnia and Serbia.

Near the Drin Gulf and Lake Skutari (Skadar), the north-west to south-east trend is brusquely interrupted by the Prokletije Mountains (North Albanian Alps) which run at right angles to the main Dinaric trend. The direction of the coastline also changes, and runs from north to south between the Drin Gulf and Cape Glossa, although the mountain chains south of the Prokletije Mountains resume almost the same trend as those to the north. In this north-to-south Albanian section the mountains are fronted seaward by malarial lowlands poor in harbours. This, together with the lawless, unsettled state of Albania, adds to the difficulty



[After Bicanlic]

FIG. 127.—THE RAILWAY SYSTEM OF YUGOSLAVIA (1939).

Note the relative absence of railway lines, and the small amount of traffic across the difficult mountain country between the Save-Danube lowlands and the Adriatic Sea.

of penetrating the Balkan peninsula from the Adriatic side. From Cape Glossa southwards the coast resumes its north-west to south-east direction, concordant with the mountains, which here form the backbone of the Greek peninsula (*see* Chapter VIII). It will be seen, therefore, that the Balkan peninsula turns its back, as it were, on the Adriatic and Italy, though it is open to the north, to the east, and to the south-east.

Structurally the system generally resembles the Dinarides of the eastern Alps, though the *nappes* here are recumbent towards the south-west.

The Yugoslav Section of the Dinaric System. North of the Drin



[Courtesy Yugoslavia Express Agency, Ltd.]

FIG. 128.—VIEW OVER THE GULF OF KOTOR (CATTARO), DALMATIAN COAST
Note the cultivation terraces on the lower slopes.

Gulf, the Yugoslav section of the Dinaric system falls into two main regions. On the west is the Karst region, composed of permeable limestone, with a fringe of more productive country in the islands and along the coast, while on the north-east lie the forested mountains and hill country of the Save drainage area.

The Western Dinaric Region. The Coastal Fringe. Along the drowned concordant coast occur strata of Cretaceous and Eocene age, in which strips of limestone usually form the islands and ridges, alternating with strips of Flysch in the depressions. Many of these depressions have been invaded by arms of the sea, giving rise to the so-called "L" and "T" gulfs and numerous islands which characterise the coast. The climate may be called Mediterranean

in type, with dry summers and usually brilliant skies, but the annual rainfall is rather heavy, Fiume, Dubrovnik (Ragusa), and Split (Spalato) on the coast having respectively 63, 59, and 34 inches.

On the limited amount of lowland, provided the soil is suitable, and on terraced hillsides, Mediterranean crops such as olives, vines, and figs are grown, though on the limestones even of the coastal belt only meagre pasture is to be found. Italian influences, *e.g.* in architecture, are ubiquitous and a considerable number of Italian-speaking people are to be found in the towns, but the great bulk of the population is of Slavonic speech, though they have adopted a Mediterranean mode of life and are largely occupied



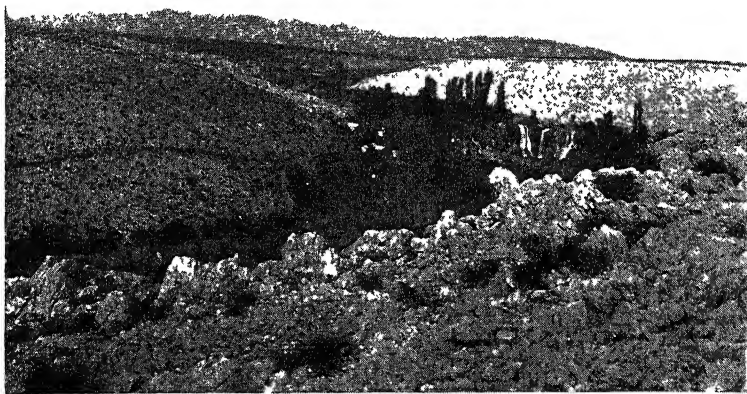
[Courtesy Yugoslavia Express Agency, Ltd.]

FIG. 129.—ZIGZAGS ON THE LOVČEN PASS.

This road leads inland from Kotor and illustrates the difficulty of penetrating inland from the coast. The barren nature of the Karstic limestone is apparent.

with horticulture and fishing. Although the coastlands have changed hands politically many times during the course of history, yet the chief towns retain their character of Mediterranean city-states, engaged in commerce by land and sea. In the Middle Ages, when ships were smaller and commercial goods consisted mainly of small, precious commodities, the latter could be brought on mule-back across the difficult mountainous interior, and more towns were engaged in commerce than at the present day; consequently, the coasts, both of mainland and islands, are dotted with picturesque little Italianate towns, complete with city-walls, loggias, campaniles, piazzas, and Renaissance palaces and churches.

Nowadays, only those towns served by the few railways are commercially important, such as Fiume-Sušak, Šibenik (Sebenico), Split (Spalato), and Gruž near Dubrovnik (Ragusa), and even these are rather small. Zara (Zadar; 20,000), which lost its rôle as capital of Dalmatia when the town became Italian in 1918 and was thus separated from its hinterland, may recapture its old position if provided with rail connections. It has the advantage over Split (44,000),¹ the present commercial capital of Dalmatia, of lying in the largest area of lowland on the coast. Split and Šibenik (37,000)



[Photo · Dr S. M. Milojević

FIG. 130.—THE KARST IN YUGOSLAVIA.

The view shows part of the Karst in the relatively low-lying section west of the Naretva and about ten miles inland. The Trebižat river shown is a right-bank tributary of the Naretva.

not only handle the local trade in wine, olive oil, and other Mediterranean commodities, but have large exports of bauxite, which is mined at two places about eighteen miles inland from each port. Split also has large cement exports, from workings situated along the "Coast of Seven Castles" (Kaštelan Bay), just west of the town.

In spite of much barren limestone, the narrow Adriatic coastal zone is an area of relatively dense population compared with the high Karstic region which succeeds it farther east. (See Fig. 136.)

¹ Population figures are from the 1931 Census.

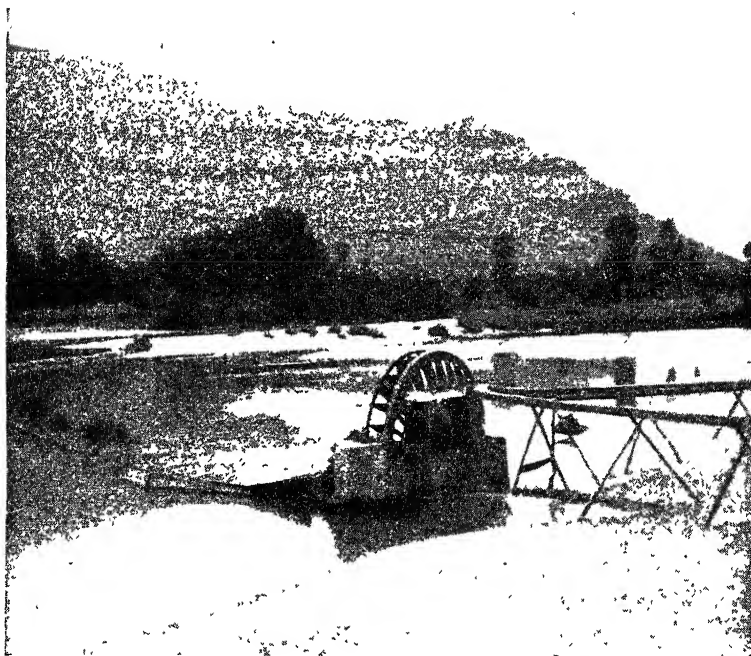
The High Karst. The high, barren limestone Karst of Yugoslavia is the most outstanding example in Europe of a type of topography which is found on a smaller scale in numerous other places, *cf.* the Causses of the Massif Central in France, the Slovakian Karst, etc. It stretches for 350 miles from north-west to south-east, and has a maximum breadth of about fifty miles. It has a maximum height of over 8,000 feet, though it is not so much the height or the breadth which makes it such a barrier, as its barren, waterless character.

Although developed on a folded mountain system, yet the region was so thoroughly peneplanated that it now consists largely of barren stony plateaus, ribbed from north-west to south-east by flattish ridges, known as *planine*, and containing elongated basins known as *polja*.

The limestone of which the whole region is composed is singularly porous, so that there is a general absence of surface water. This is not owing to any lack of rainfall; on the contrary, the rainfall is one of the heaviest in Europe, reaching over 180 inches in places. This precipitation, however, disappears underground and forms a vast network of subterranean drainage which is useless to the inhabitants of the region, who are obliged to procure their water supply by storing snow in caves and rainwater in cisterns. Only one river, the Neretva, traverses the whole of this zone above ground, and this only maintains itself because it has been powerful enough to cut a deep cañon which reaches below the water-table and so is fed from subterranean springs at the sides of the gorge (*cf.* the Tarn gorge in the Causses of France). It seems likely, however, from the presence of dry valleys on the plateau surfaces, that there was more surface drainage in former times than at present. This view is borne out by a number of now dry *polja* which have fresh-water Tertiary deposits, indicating that karstification was undoubtedly intensified by the re-elevation of the whole area and the consequent lowering of the water-table.

The scanty vegetation of the Karst can support only a few sheep and goats, apart from the occasional depressions where a little soil has accumulated and where cultivation can accordingly be carried on. These depressions fall into two main classes, the *polja* (sing., *polje*, a Serbian word meaning "field"), which are large depressions running parallel to the strike of the rock, and *dolina* (sing. *doline*), which are small round depressions formed by the solution of the limestone and floored with a residual soil of a bright red colour. To these may be added the lowlands of the lower Neretva valley. Many *polja*, unfortunately, are inundated in autumn and spring, which are the rainiest seasons, and therefore are useless for perennial cultures such as trees, or for crops which need a long growing season.

They are therefore devoted almost entirely to cereals, maize in the lower *polja*, e.g. Popovo, and wheat in the higher. Unduly prolonged inundation causes famine. Lake Skutari (Skadar) may be looked upon as a *polje* which is permanently flooded. The *polja* concentrate most of the scanty population of the High Karst. There are few urban centres of over four thousand inhabitants, the main exception being Mostar (20,000), the old administrative centre of Hercegovina, situated at an important crossing place of



[Photo Margaret R. Shackleton

FIG. 131.—THE POPOVO POLJE NEAR TREBINJE.

Verdure along the river contrasts with the completely arid limestone mountains which surround the polje.

the River Naretva, and a market centre for the lower Naretva valley. Cetinje (9,000), although the former capital of Montenegro, remains small.

The High Karst descends to the coast by abrupt gradients. Accordingly, although movement along the grain of the Karst is relatively easy, it is very difficult to find practicable routes down to the coast either for road or rail. Only three railway lines reach the coast, and these are all single-track. In the north the twin

ports of Fiume-Sušak are served by a standard-gauge line with very steep gradients; the Split-Šibenik area is connected with the Lika *polje* by another standard-gauge line, but communication farther inland to the middle Save lowlands is by narrow-gauge through difficult country. The Dubrovnik-Gruž area has only very circuitous narrow-gauge connections inland, with two rack-and-pinion sections. The haulage of heavy loads and a frequent train service are out of the question on these narrow-gauge, single-track lines, with their many steep gradients and sharp curves, so that little traffic from the Save-Danube lowlands finds its way across the Karst to the Yugoslav ports. Roads running inland from the coast are relatively numerous, but usually possess hair-raising zig-zags and gradients, and again are unsuitable for heavy traffic.

The Albanian Section of the Dinaric System. The great Prokletije range, also known as the North Albanian Alps, forms the boundary between Yugoslavia and Albania. The summits of this range, attaining over 8,000 feet, were carved into Alpine forms as the result of the Quaternary glaciation.

The little country of Albania is unique in the Dinaric lands in not having a concordant coast. Although the direction of the coastline changes from north-west-south-east to north-south, the direction of the ranges is generally constant, and a triangular-shaped lowland, seamed with lines of low hills, is developed on the Flysch and Tertiaries of the coastal zone. This lowland has its base along the Adriatic coast from the Drin Gulf to Cape Glossa, and its apex near Elbasan. The coastline alternates between low headlands and swampy depressions and there is no good harbour, though Durazzo (Alb., Durrës) was well known in Roman times. The depressions of this lowland are swampy and malarial, and the limestone hills covered with maquis which give pasture only to sheep and goats, so that there are few opportunities for agriculture. The climate is Mediterranean.

Apart from the capital, Tirana (about 31,000), the settlements of any size lie along the foot of the mountains or just within them. A new road, following the line of the old Via Egnatia, goes *via* Durrës and Elbasan to Lake Okhrida, and a railway is under construction between Elbasan and the coast at Durrës.

The southern section of Albania, sometimes known as Albanian Epirus, begins with Cape Glossa and runs concordant with the coast. Lofty mountain ranges, running north-west to south-east, alternate with deep river valleys, along which Greek influences have penetrated from Greek Epirus, and the inhabitants of the southern valleys, Viosia, Dhrino, Osum, are Greek in religion, and to some extent in culture, thus affording a bone of contention

between Greece and Albania. Pastoral life prevails, as on the southern side of the frontier. Where these ranges run out to sea the excellent harbour of Valona (Alb., Vlona) is developed in an intermontane depression.

The high mountain zone of interior Albania stretches southwards from the River Drin to the southern end of Lake Prespa. There are four, and in places five, more or less parallel zones. The outer or western mountain zone consists of bare ranges through which

rivers flow in difficult gorges to the lowlands. There is an inner tectonic depression, occupied by the upper courses of various rivers and filled by young sediments, which offers facilities for agriculture. This discontinuous depression is succeeded eastwards by the lofty central zone, where there is much forest, though it has been partially cleared. The range is very difficult to cross, except in the north and south, and offers a great barrier between the western longitudinal furrow and the next depression. The latter is occupied by the Black Drin, Lake Okhrida (or Ochrid), and the Koritsa (Alb., Korçe) basin, but is divided up into compartments and is not so traversable as might appear from a small-scale map. Part of this furrow is in Yugoslavia. A fifth zone comprising the third band of mountains lies

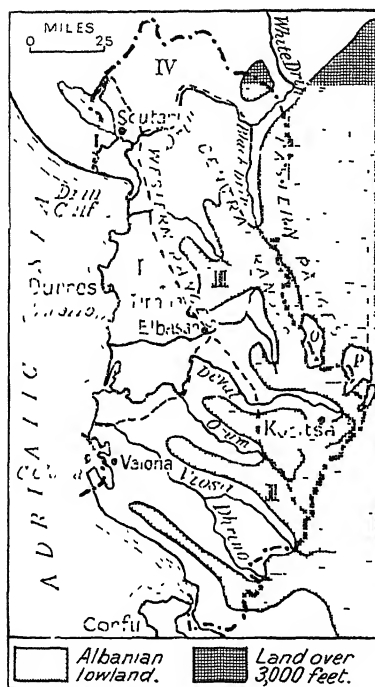


FIG 132.—ALBANIA: GEOGRAPHICAL REGIONS

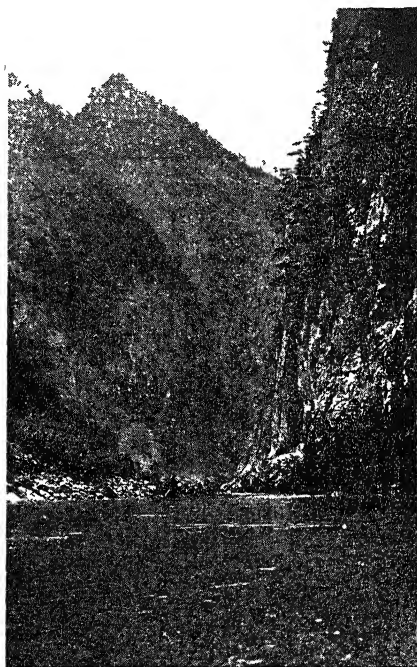
mainly in Yugoslavia, except in the north. (See Fig. 132.)

These zones are separated by the River Drin from the North Albanian Alps. This river takes advantage of a lowland bay in the coastal Tertiaries and of the absence of the Karst belt to develop a transverse valley, and river capture has enabled it to tap the Metoja (or Metohija) basin by means of its tributary, the White Drin. The Metohija basin is in Yugoslavia, though its population is largely Albanian.

The full explanation of the backwardness of the Albanian people is a long story, and when all has been said the fact remains somewhat puzzling. The extreme division into tiny compartments of lowland separated from each other by lofty mountains was no doubt adverse to the advances that come through co-operation and knowledge of other peoples. Also many of the Albanians embraced Islam at the time of the Turkish conquests, and so cut themselves off still more from western Europe. A patriarchal organisation of society prevailed up to 1945 at least, and blood feuds were rife until recently. The exports are almost negligible and consist mainly of cheese, animals, and eggs in normal times, apart from the valuable mineral oil.

Albania was under Turkish rule up to 1913. After a period of troubled independence it became an appendage of Italy, even before the "conquest" on Good Friday, 1939. Now this tiny land of 11,000 square miles and a million souls is a satellite State of the U.S.S.R.

The Eastern Dinaric Region. The Karst belt is succeeded eastward by a zone of forested mountains with normal river drainage. The rocks are very varied, ranging from Tertiary material of various kinds in the foothills of the north-east, bordering the Save valley, to Palæozoic sandstones, shales, and crystalline schists, but on the whole Mesozoic rocks (sandstones, limestones, shales) predominate. In a few places very ancient crystalline rocks of the pre-Cambrian floor are exposed. Although there are considerable areas of limestone, they are not sufficiently large to have any great effect on the river-system, and with considerable soil-cover they are

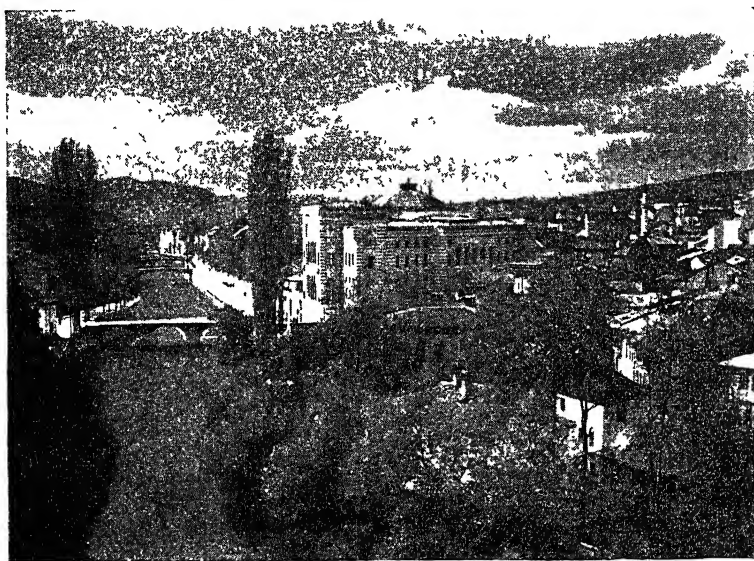


[Photo · "Putnik"]

FIG. 133.—GORGE ON THE RIVER DRINA.

The right-bank tributaries of the river Save cut across the "grain" of the Dinaric mountain system, and flow through many gorges.

usually forested. The mountain ranges trend from north-west to south-east, with summit levels of about 6,000 feet, increasing to over 7,000 in the south-east. The whole area is highly dissected, and movement in any direction is confronted by rugged country. Although the Eastern Dinaric Region is drained by the right-bank tributaries of the Save,¹ such as the Drina, Bosna, Vrbas, and part of the Una-Save and Kupa systems, yet these rivers offer singularly little help to movement, as the valleys are cutting across the grain



[Photo "Putnik"]

FIG. 134.—SARAJEVO.

The fourth largest city of Yugoslavia and the capital of Bosnia-Herzegovina, Sarajevo stands at the edge of a fertile basin surrounded by mountains. The city retains a somewhat oriental appearance; note the minarets.

of the country and contain long gorge-like stretches. Nevertheless, very considerable efforts have been and are being made to provide this tangle of forested mountains with transport facilities, for it possesses great riches of timber, considerable mineral wealth, and several fertile basins of productive agriculture, of which the largest is that of Sarajevo. About half of the total surface of Bosnia is forest covered, with beech, oak, and conifers predominating, and the area produces a large part of Yugoslavia's export of constructional timber, which normally figures as the country's

¹ Sava in Serbo-Croat.

most important export. Teslić, on the Usora, a left-bank tributary of the Bosna, claimed to have the largest wood-distillation factory in the world. The minerals include scattered deposits of salt, iron-ore, lignite, and bituminous coal; the most noteworthy deposits of iron and lignite occurring at the northern end of the Sarajevo basin. This basin forms the fertile heart of Bosnia. It forms a large isolated agricultural clearing, stretching some fifty miles from north-west to south-east, developed on the lightly dissected site of a Tertiary lake-basin, and entirely surrounded by lofty mountains. Sarajevo (78,000)¹ itself is the fourth largest city of Yugoslavia, and a noted commercial centre. The iron and lignite mines have led to the establishment of blast-furnaces and steel mills at and near Zenica, with a production capacity designed to cover the country's total requirements of raw steel, steel rails, and similar products. Communications with the outside world are difficult and are mainly by narrow-gauge, single-track railway, though one of the famous "Youth" railways, built subsequently to 1945, forms a valuable link with the main Zagreb-Belgrade line.

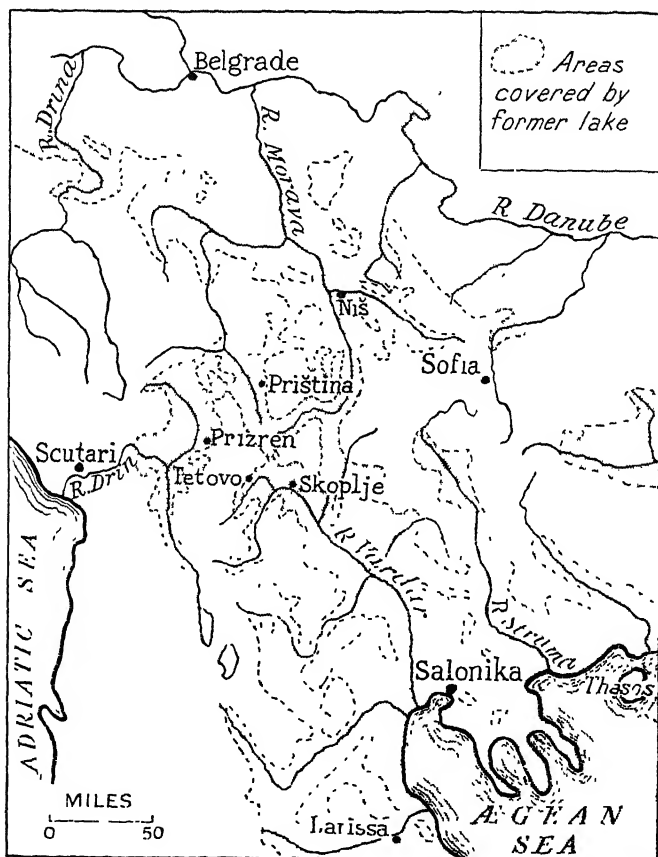
Along the north-eastern margins of the East Dinaric zone the young Tertiary hill-country slopes down to the Save lowlands (Posavina). The land has been largely cleared for cultivation and is densely populated. Mixed farming is practised, orchards are numerous with plums predominating (for the production of prunes and plum brandy), maize is the chief cereal, while cattle- and pig-rearing are of considerable importance.

The Mountain-and-Basin Corridor Lands. Between Belgrade on the north and Salonika in Greece on the south lies a stretch of rugged country, about 300 miles long from north to south and about ninety miles wide from east to west, which lies mainly on the crystalline rocks of the Rhodope Massif, and which is threaded by a remarkable series of tectonic basins, mainly lying along the courses of the Morava, Ibar, Vardar, and Struma Rivers. These basins are generally aligned with an axis from north-north-west to south-south-east and so give the shortest possible route through the Balkan peninsula from central Europe to the highway of the Mediterranean Sea. Although this corridor area is often rugged, yet it is bounded to east and west by land which is definitely higher, wilder, and more difficult to traverse, particularly in the Balkan Mountains and the Rhodope on the east and the Dinaric ranges on the west. Only at one point does traffic seriously escape from the guiding lines of the corridor, namely, where the basins and gorges of the Nišava tributary of the Morava have been traversed by a

¹ Population figures are from the 1931 Census.

railway leading to Sofia and so onwards to Constantinople (Istanbul) and the "land" route to Asia *via* the Bosphorus.

The "corridor lands" lie mainly in Yugoslavia. Here there is a double line of movement; an easterly route which was formerly used by a Roman road following the River Morava and the lower



[After Cvijic]

FIG. 135.—THE AEGEAN LAKE OF THE LATE TERTIARY AND EARLY QUATERNARY PERIODS IN YUGOSLAVIA AND ADJACENT REGIONS.

Vardar; and a westerly one which was used by the mediæval "Carski Put" or Imperial Way, going *via* the River Ibar and the Kosovo *polje* and joining the first route in the neighbourhood of Skoplje. Both are now followed by a railway, the more easterly route carrying the main line. A possible continuation of the

western route lies southward of Skoplje through the Pelagonian basins. The Struma valley (Bulgarian) is a less important thoroughfare than the Morava-Vardar system, as it affords a less direct line of communication between central Europe and the Mediterranean, but a railway links Sofia to the Ægean coastlands *via* this route.

As already mentioned in the introduction to the section on south-central Europe, these basins were formed in mid-Tertiary times, when dislocations led to segments of the Rhodope-Pelagonian mass rising and sinking like the slabs of a badly laid pavement. The down-faulted areas became filled by branches of the fresh-water Ægean lake, which shrank intermittently, so that all the basins have bordering terraces more or less dissected by sub-aerial erosion, while the middle portions tend to be flat. The gorges connecting the basins are usually cut in the Tertiary sediments, though sometimes they reach to more solid rock.

The gorges naturally offer difficulties to road and railway construction, and neither the Vardar-Morava nor the Vardar-Ibar routes can be said to be particularly easy, though there is no high watershed to be crossed in either case. The water-parting between the Vardar and Ibar is indefinite, feeders of both rivers rising in the Kosovo *polje* and the water at the source having an indeterminate flow.

Although possessing many similarities, there are, nevertheless, certain differences between the northern part of the corridor lands (the Morava drainage area) and the southern part (Vardar drainage area). South of the Šar Planina and the Skopska Cerna Gora, which run from north-east to south-west and almost cut off the Morava basin from the Vardar basin, the climate and vegetation, as well as the population, differ considerably from those farther north. The Skoplje basin already has the rather dry summers that foreshadow the Mediterranean régime; consequently the low-lying tillable lands tend to be devoted to wheat rather than maize which is characteristic farther north, and irrigation is practised to some extent for such crops as tobacco, rice, and even cotton. The mountains carry less forest than farther north, and many summits are entirely bare. The Vardar drainage area, which is often known as South Serbia, also carries the name of Northern Macedonia, which suggests its historical associations and its confused ethnology, its people forming a very "macédoine." The area was Turkish until 1912, and contains people claimed by Bulgaria as Bulgarians and by Yugoslavia as Yugoslavs, in addition to small groups of Albanians, Greeks, Vlachs, and Turks, who were formerly more numerous. South Serbia contains many market towns which date back to Roman times at least, such as Skoplje (68,000), Bitolj

(33,000), and Prilep (23,000), now often smaller than formerly, with the exception of Skoplje, which is growing rapidly owing to its good rail connections, and its rôle of administrative and commercial centre.

The Morava drainage area, which was mainly densely forested a hundred years ago, was the nucleus of modern Serbia; the lower northern section, known as the Šumadia, being especially significant. In spite of the lofty Kopaonik Mountains, composed of resistant serpentine rock, the area is at a lower average height than the Vardar region. Until the middle of the eighteenth century it contained practically no towns except Belgrade and Smederevo on the Danube, but it has been developed very actively during the present century. Both the Morava and Vardar areas possess considerable mineral wealth, but those of the more northerly area are more actively exploited. The most important mines include the famous Trepča zinc and lead mines¹ in the Kopaonik Mountains, one of the largest lead-zinc producers in Europe, chrome north-west of Skoplje, and brown coal east of the lower Morava.

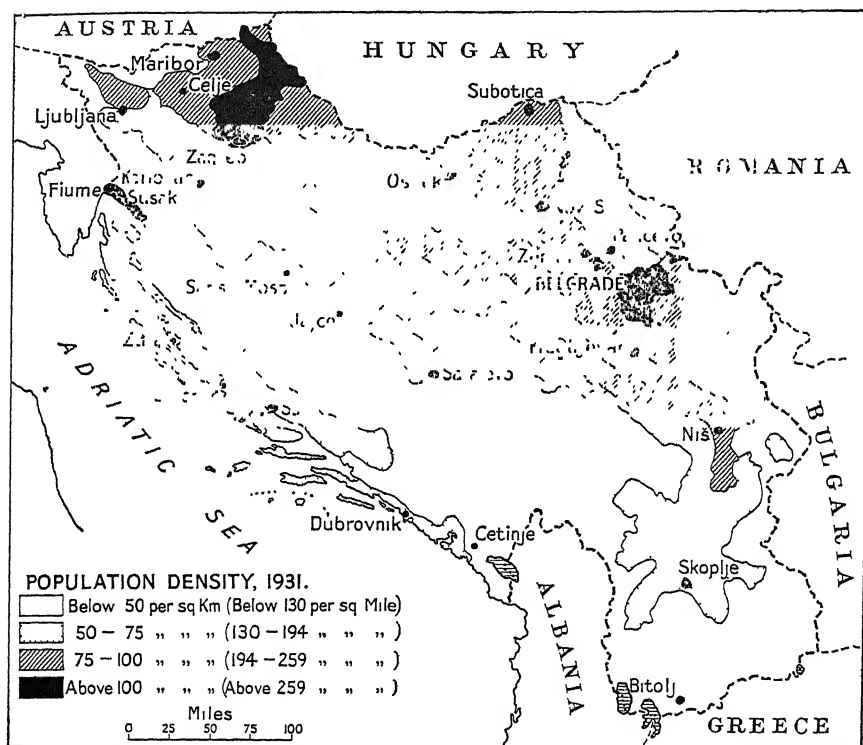
The Balkan Mountains. The mountain-and-basin corridor lands are bounded eastwards by the Balkan Mountains in the north and by the High Rhodope farther south. The Balkan Mountains in Yugoslavia are usually known under the title of the Mountains of North-East Serbia. They continue the same direction and character as the Banat Mountains on the northern side of the Danube. The crystalline zone contains the mineralised regions of Maidanpec and Bor, with copper and pyrites. The mountains are studded with a number of fertile tectonic basins, *e.g.* Zaječar on the Timok, Pirot and others on the Nišava, which are often separated from each other by gorges. Niš (35,000) is a town of marked nodality near the junction of the Nišava River with the southern Morava River.

Yugoslavia. The political unit of Yugoslavia has grown snowball fashion since 1821, when its Serbian nucleus, the Šumadia region, won its freedom from the Turks. The collapse of the Austro-Hungarian Empire enabled the Croats and Slovenes to join up with the Serbs, but the new state included peoples in very diverse stages of development, and as in the case of most of the new composite states, the post-1918 history has not been without stormy passages. It was only about a hundred years ago that the now well-cultivated lower Morava valley was under oak forests, whose acorns nourished large herds of pigs, as in Norman times in England. The people in the mountainous districts are still very primitive. On the other hand, the Slovene lands have shared in the higher standards of

¹ Worked prior to 1940 by an Anglo-American Company.

culture prevalent in Austria, and the Croats also pride themselves on their more advanced ways. Since 1945, the country has been organised on a federal basis.

The interest of the outside world in Yugoslavia has centred mainly on her command of the routes to the Ægean and the



[After Melik

FIG. 136.—MAP OF POPULATION DENSITY IN YUGOSLAVIA (1939 FRONTIERS).

Note the belts of comparatively dense population along the Save-Drave Lowlands and the Morava Corridor with their focus on Belgrade. These are separated from the moderate densities of the Adriatic coastlands by the scantily peopled Dinaric Alps, in which the Basin of Sarajevo stands out as a population "island." Low densities also occur in the Vardar Basin and in the Mountains of North-East Serbia.

Bosporus. In fact, its political geography has overshadowed all other aspects. It was to the advantage of the Central Powers to keep Serbia and Bulgaria weak, dependent states, in order to have no interference with their "Drang nach Osten" policy and with their scheme for a central Europe under German domination. Nor

did Italy in 1919 welcome a powerful neighbour on the other side of the Adriatic. Hence the annexation of Bosnia-Hercegovina by Austro-Hungary and Italy's claims on Fiume, Zara, and the Adriatic islands, to which some colour was lent by historical associations and the presence of many Italians. The Slavonic language of the Yugoslavs predisposed them to Russian sympathies, but like Czechoslovakia, the country owed much to support from the U.K., France, and U.S.A.

Yugoslavia has now an area of 96,000 square miles, *i.e.* it is rather larger than Great Britain, and possesses a population of 16 millions,¹ of whom about 83 per cent. are either Serbs, Croats, or Slovenes. Owing to the mountainous nature of much of the country, the

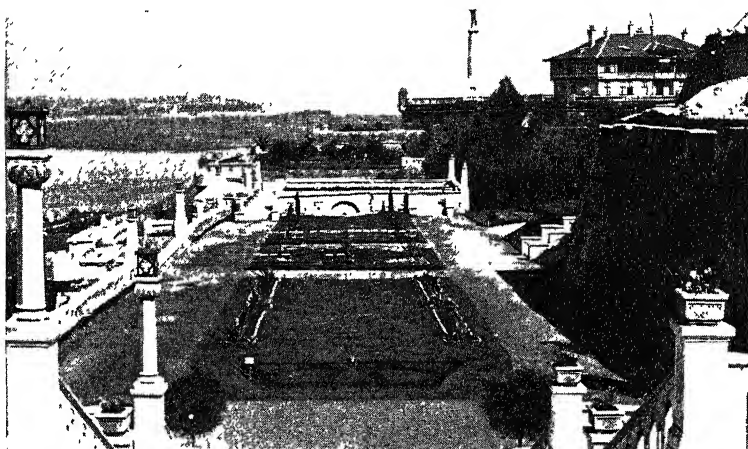


FIG. 137.—BELGRADE: THE OLD FORTRESS AND GARDENS.

In the distance can be seen the Save-Danube confluence, with low islands in process of reclamation.

population density is not high, but in 1931 varied from 197 per square mile in the low-lying Dunavska province, which includes the former regions of the Banat, Bačka, Voïvodina, and the northern Šumadia, 186 in Dravska province (the former Slovenia), 174 in Savska province (the former Croatia), to 78 in Zetska province (the former Montenegro). The population is mainly rural, and, as in Romania, sweeping measures of agrarian reform were carried out at the end of the war of 1914–18 in order to satisfy the land hunger of the peasants. At the same time feudal obligations, inherited from the Turkish régime were done away with. The addition of the grain-producing lowlands of the new provinces across the Save greatly added to the agricultural wealth of the country. South of

¹ Estimated 1950 population, 16,148,000.

the Save-Danube line forests and pasture occupy more land than cultivated crops.

The forested and agricultural nature of the whole country is well borne out in the export list. Timber came easily first in the 1930's, followed by eggs, grain, pork, raw copper, animals, hops, meat, cement, and prunes. The country, however, is in a rather better position than Hungary and probably than Romania for industrial development. Her deposits of iron-ore, though unknown in detail, are thought to be large, and her brown coal supplies, though very scattered, are greater than those of Romania. In the 1930's Yugoslavia rivalled Germany as the chief European producer of lead-ore, and ranked third or fourth among European producers

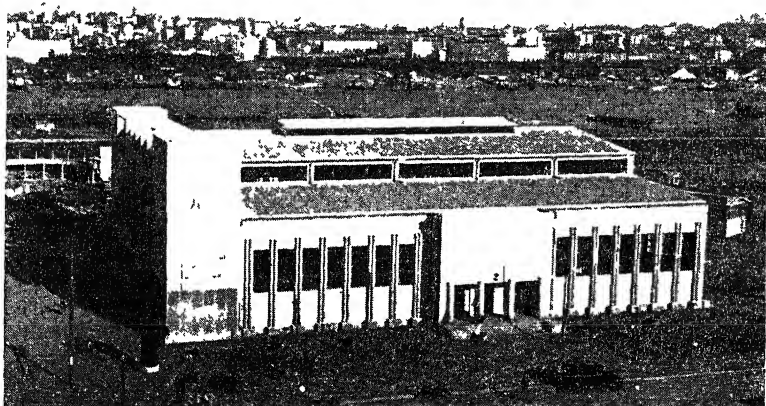


FIG. 138.—BELGRADE FROM ZEMUN.

The view shows one of the industrial quarters of the town and the River Save.

of zinc, and fourth producer of bauxite. The country was the chief European producer of antimony and chrome, though the production of both was small.

Of the cities Belgrade (Serb., Beograd) grew very rapidly after 1918, from 112,000 in 1921 to 240,000 in 1931, and was largely rebuilt in western style. The heart of the town, whose name means "white castle," lies on a hill-promontory overlooking the Save, just to the west of its junction with the Danube. Both east and west of Belgrade the Danube and Save have marshy banks as far as the Iron Gate on the east and the Drina on the west. Its position at the northern end of the corridor lands exposed it to frequent attack in the past, but is excellent from a commercial point of view. Since

the accession to Yugoslavia of the southern part of the Hungarian plain, Belgrade is no longer situated on the extreme edge of the country.

Zagreb (186,000), the former capital of Croatia-Slavonia, is the second city of the country and an important banking and commercial centre. It manufactures alimentary produce, e.g. beer, flour, and also possesses numerous other industries, especially saw-milling and timber work, textiles, engineering, including the making of rolling stock. Subotica (100,000) competes with Novi Sad (64,000) for the position of regional capital and chief market of the fertile southern part of the Pannonian basin, and both have varied agricultural and other industries.

REFERENCES

An excellent general account of the Balkan countries is given in Part 2 of Vol. VII of *Géographie Universelle*, entitled *Italie, Pays Balkaniques*, by Y. Chataigneau and J. Sion (Paris, 1934).

The classic *La Péninsule Balkanique, Géographie humaine*, by J. Cvijić (Paris, 1918), although somewhat out of date, contains much interesting material.

See also *Royaume de Yougoslavie, Aperçu géographique et ethnographique*, edited by P. Vujević (Beograd, 1930). On the economic aspect, see "Economic Resources and Problems of Yugoslavia," by M. R. Shackleton (*Scott. Geog. Mag.*, Nov., 1925); *Les Ressources et l'Activité économique de la Yougoslavie*, by R. Aranitović (Paris, 1930), and *Die Wirtschaft Jugoslaviens* (Beograd, 1937), a government sponsored publication. On the human aspect, see *Peasant Life in Yugoslavia*, by Olive Lodge (London, 1941); *Slovene Studies*, edited by L. Dudley Stamp (London, 1933); "The effects of war on rural Yugoslavia," by R. Bičanić, *The Geog. Journal*, Vol. CIII, pp. 30-49 (London, 1944); *The Italo-Yugoslav Boundary*, by A. E. Moodie (London, 1945).

CHAPTER XXXI

THE BALKAN PENINSULA (II)

THE BULGARIAN LANDS, TURKEY-IN-EUROPE, MACEDONIA AND THRACE

THE Bulgarian lands border the middle corridor lands of the South-Eastern peninsula on the east and fall naturally into a number of roughly east-west parallel zones. On the north, the Bulgarian Platform rises to the Balkan Mountains, which are succeeded in turn by a long line of depressions. These depressions are followed on the south by the Rhodope Massif, which lies at a high level in the west, almost disappears in the middle, and rises once again in the Istrandja Mountains of European Turkey.

The Bulgarian Platform. This region has already been compared and contrasted with the Walachian plain. It consists of unfolded layers of Cretaceous limestone and sandstone with a strip of Tertiary material overlying them in the north, though the whole of the solid geology is concealed by a mantle of löss. The gently undulating surface of the Platform is cut into a number of segments by almost cañon-like valleys which traverse the region from south to north, thus rendering east-west movement difficult, in contrast to the general ease of movement on the Walachian plain. Apart from these valleys there is a marked absence of surface water, and settlements are accordingly agglomerated round wells or in the narrow valleys, with the interfluves having very few villages. This treeless land naturally lends itself to the cultivation of cereals, of which there is a large surplus for export. The chief towns are Varna (70,000)¹ on the Black Sea coast, which is the main port for the whole country, and Ruse (Ruschuk; 49,000), the chief port on the Danube. The frontier between the Bulgarian Platform and the Dobruja was once marked by a belt of forest, known as the Deli Orman (=“bad forest”), but this has now practically vanished.

The Balkan Mountains. The Bulgarian Platform rises gradually southward to the foot-hills of the Balkan Mountains and of their north-western continuation, the Mountains of North-East Serbia. The term Stara Planina is usually applied to those east of the

¹ Population figures are from the 1934 Census, unless otherwise stated.

Bulgaro-Yugoslav frontier, which reaches the Danube along the lower stretches of the River Timok, but both sections belong to the same system.

The Balkan Mountains, as in the case of the Carpathian system generally, owe their present height to a new upward impetus which followed the peneplanation of the original folds. Considerable traces of this peneplanation still remain, especially towards the eastern end, east of the longitude of Sliven, where both the original folding and the subsequent re-elevation were not very great. The transition zone between the mountains and the Bulgarian Platform is marked by a line of small towns, *e.g.* Vratca, Pleven, and Trnovo, on or near the rivers leading into the highlands. The northern ranges consist mainly of varied Cretaceous material with long bands of limestone forming ridges. These northern ranges are well forested. The passes are numerous and not difficult to mountain folk. Two lines of railway traverse the range, the most important going *via* the Isker valley to Sofia, and the other *via* the Šipka pass to Kazanlik in the Tundža basin.

The highest zone, mainly rising above the forest, is found near the south and consists mainly of Palæozoic shales interspersed with masses of granite. The eastern Balkans lack the Palæozoic and granitic material, but though lower are less easy to cross, partly on account of the dense tangle of forest growth, and partly owing to the paucity of transverse valleys. They run out to sea at Cape Eminé.

On the south the mountains fall rather abruptly to a series of basins. These begin in the west with that of Sofia and continue eastwards for almost the whole length of the chain, the longitudinal sections of the Striema and Tundža valleys being especially noteworthy. The Sofia basin is shut in on the south by a branch of the Balkan Mountains which leaves the main chain in Yugoslavia, south of the Pirot basin, and runs in a south-south-east direction to come up against the Rhodope mass. The basin of Sofia (Bulg., Sofiya) lies at a height of 1,800 feet and is surrounded on all sides by high mountains, yet is very accessible owing to the peculiarities of the river system in this section of the South-Eastern peninsula, and especially owing to the extraordinary course of the Isker. This river rises in the granitic Rila Planina, one of the highest parts of the Rhodope, traverses one of the many mountain-girt basins of this Bulgaro-Yugoslav borderland (that of Samokov), and breaks through another ancient granitic massif to enter the basin of Sofia. Continuing in a northerly direction, it proceeds to break through the Balkan Mountains. Three other river systems; the Nišava, Maritsa, and Struma, radiate from this complex area of basins and mountains, and offer a number of routes leading up to the basin

of Sofia. The small size of the basin has prevented the area from obtaining the full advantages of its position, whose nodality is unique in the whole of the Balkan peninsula. It contains the capital city, however, whose population numbered 287,000 at the 1934 census. The eastern basins are shut in on the south by the Anti-Balkans, known in Bulgaria as Sredna Gora, or "middle mountains," a zone of low, rounded mountains composed of crystalline schists with granitic masses and some young volcanic material. The fertile low-lying basins of the upper Striema and Tundža are particularly well-sheltered and have been called the garden of Bulgaria. The



[Courtesy Bulgarian Legation]

FIG. 139.—SHEPHERDS IN THE BASIN OF SOFIA.

rose gardens of the upper Tundža produce oil for the famous scent, "attar" of roses.

To the south of the Anti-Balkans lies a considerable stretch of lowland, occupied in the west by the upper Maritsa basin, one of the many old lake basins of the Balkan peninsula. Owing to the fertile alluvial soil, hot summers, and abundance of water, it grows a variety of products, including maize, cotton, the vine, tobacco, tomatoes, rice, etc., partly under irrigation. The villages lie sheltered among walnut, sweet-chestnut, and cherry trees. It is inhabited mainly by Bulgarians, but only became part of that state in 1885. Plovdiv (Philippopolis, 100,000) is fast losing its oriental character.

The High Rhodope. Between the Struma and the Maritsa rivers the central portion of the Rhodope mass remains as a fairly continuous area of high land. The Pirin (Perim) and Rila mountains, and the

Rhodope Mountains proper, present considerable areas over 6,000 feet high, and include what is considered to be the highest mountain in the south-eastern peninsula, namely, Mussalla, in the Rila Planina, 9,613 feet. The forested mountains generally present rounded slopes recalling the former peneplain character, but the Pirin and Rila highlands are residual masses rising above the general level of the dissected plateau, and were high enough to develop glaciers during the Quarternary Ice Age, with the result that cirques and moraines are numerous. The whole central area is very little known to the outside world. It contains no railway and hardly any roads.

Eastwards the Rhodope Mountains sink gradually to uplands composed of young volcanic rock (andesite), drained by the Arda tributary of the Maritsa, and these in turn merge into the hills through which the Maritsa and Tundža break their way just north of Adrianople (Turk., Edirne). These hills are formed of crystalline schists, and link the Rhodope mass to its outlying portion, the Istrandja Mountains, whose little-explored forested heights extend from the Bulgaro-Turkish frontier to the roots of the Constantinople peninsula.

The Bulgarian State and People. This interesting country and people have been strangely neglected by English writers. The Bulgars came into their present home in the eighth century, having previously been neighbours of the Magyars in the lower Volga region. They evidently mingled with the Slavonic-speaking peoples, whom they dispossessed and whose language they adopted. Their traditions, however, have prevented them from throwing in their lot with the Yugoslavs.

It was not until 1908 that they finally secured their freedom from Turkish suzerainty, though Bulgaria north of the Balkan mountains obtained its autonomy in 1878 and joined with eastern Rumelia in 1885. In spite of its proximity to Constantinople, Bulgaria does not seem to have suffered so much from Turkish occupation as might be expected and the somewhat dour peasant farmers have shown tremendous powers of resistance and recovery. Larger than Hungary, but smaller than any of the other States of South-Central Europe, Bulgaria has a population of five and a half millions, who are almost entirely dependent upon agriculture and forestry. A quarter of the total area is under forests, but little timber is exported, the main exports being tobacco, from the Struma and Mesta valleys, followed by wheat and maize, eggs, rape seed, fleeces, silk cocoons, and rose oil. Industry is undeveloped, and the old hand-weaving for which the Bulgars were famous seems to be dying out. There is little information available about possible mineral wealth, but

the brown coal of Pernik, in the Sofia basin, is of considerable importance.

The two sea ports of Bulgaria, Varna and Burgas (36,000), are both on the Black Sea.

TURKEY-IN-EUROPE

The basin of the River Ergene and the lower Maritsa, also known as the basin of eastern Thrace, extends south-westwards from the Istrandja Mountains. It is filled with Tertiary sediments, which are covered in places with Quaternary gravels and more recent alluvium. It is very level in the middle, but is dissected into undulating country round the border. It is mainly a region of steppe, caused by its basin configuration, permeable soil, late-summer drought, and cold winter winds. The lower portions of the basin provide only pasture, though the higher regions, which have a heavier rainfall, are cultivated.

Climatically this area seems to combine the bad points of both the Central-European and Mediterranean régimes. The prevailing winds are northerly all the year round, though calms are very frequent. This means cold dry winters and dry hot summers, so that the winters are too cold for the Mediterranean crops and the summers too dry for those of central Europe. In autumn and spring the region shares in the Mediterranean "former and latter" rains, but June to September inclusive are almost rainless months. In winter occasional cyclones passing from the Mediterranean to the Black Sea bring southerly winds and thaw, so depriving the ground of its protective snow cover. It is evident that the evils of this marginal climatic position are enhanced by the basin shape, since the bordering Istrandja and Rhodope Mountains have much heavier rainfall and a consequent timber covering.

The basin is enclosed on the south by a line of bare hills composed of folded Cretaceous and Tertiary material with a core of ancient rock. These border the Gulf of Xeros and the Sea of Marmara, and form the boundary between the Thracian steppe and the narrow coastal fringe of Mediterranean climate. This range of young folds, known in its highest part as the Tekir Dag, is of doubtful tectonic affinity.

The Marmara Region and Constantinople (Istanbul). The Straits zone has possessed great international importance since the days of the struggle between the Greeks and the Trojans. The narrowness of the entrances to the Black Sea means that this piece of water can be controlled under modern conditions by a land power not possessing a single ship. The economic importance of this ice-free sea

exit to the Russian people was at one time very great, but one might suppose that it would have less significance for the U.S.S.R., which avowedly aims at autarchy (economic self-sufficiency).

The Dardanelles and the Bosphorus are both drowned river valleys, though probably not parts of the same river, it now being thought that a watershed lay near Istanbul. The harbour of Istanbul, known as the Golden Horn, is a drowned tributary valley, in which shipping could lie out of reach of the strong current that streams through the Bosphorus from the Black Sea.

With the decay of the Ottoman Empire, Constantinople declined in importance and the removal of the Turkish capital to Ankara was another very serious blow. However, its mixed population, which is largely composed of Greeks, Jews, and Armenians, has not abandoned its efforts to control Anatolian trade and commerce, especially since the Greeks have been driven out of Smyrna and the Anatolian coastlands. New industries were started in the neighbourhood, *e.g.* soap, chemicals, machinery, iron-founding, cotton-spinning. Another interesting feature is the development of its university on modern lines, with an academic staff consisting largely of Jewish refugees from German universities. The nodality of the site is too great for the city to be easily extinguished and the population numbered 845,000 in 1945, and so it is the second largest city of south-central Europe, being exceeded in numbers only by Budapest.

THE GREEK LANDS OF MACEDONIA AND WESTERN THRACE

As a result of the Second Balkan War and World War I, Greece secured the coastlands round the head of the Ægean, thus cutting off Yugoslavia and Bulgaria from direct access to that sea. These lands are developed on the southern part of the Rhodope massif. They consist of deltas and faulted basins separated by mountain zones running out to sea. They have a Mediterranean climate, although the amount of tillable land is limited owing to the swampy, malarial nature of the lowlands. The foot-hills, however, are adapted to Mediterranean horticulture, and this, together with the excellent position for controlling trade with the interior, attracted the Greeks from early times. The rest of the population is Slavonic-speaking, though whether their language is a dialect of Bulgarian or not is a matter that has been hotly debated in dozens of volumes. There are also numerous Jews, and before 1923 there were considerable numbers of Turks. The establishment here of large numbers of Greek settlers driven out of Turkey in 1923

has caused a great preponderance of Greek-speaking people. With the help of gifts of foreign money, mainly from England, U.S.A., and France, the basins were converted into excellent agricultural lands, growing many crops, largely under irrigation, but with tobacco as the most important export.

Salonika (Gk., Thessaloniki; 237,000 in 1928) is easily the largest town, owing to its favourable position at the southern end of the Morava-Vardar corridor lands. It stands to the east of the Vardar delta and its port is somewhat out of the way of the silt from that river. Kavalla (50,000) is the port of the fertile Drama basin and similarly stands clear of deltaic silt.

REFERENCES

Hochbulgarien (2 vols.), by H. Wilhelmy Vol. I, 1935, Vol. II, 1936 (Kiel), and *Mittelbulgarien*, by J. H. Gellert (Berlin, 1937), are among the best of the considerable number of scholarly works on Bulgaria, published at the instigation of Prof. A. Penck. *Bulgaria, Past and Present*, by G. C. Logio (Manchester, 1936), is popular in scope, but the author is thoroughly well acquainted with the country. See also, "La Bulgarie," by A. Demangeon (*Ann. de Géogr.*, Vol. 29, 1920), and "Bulgaria: A Summary," by S. H. Beaver (*Geography*, Vol. XXV, Dec., 1940). "Tektonik der Balkan Halbinsel," by J. Cvijić (*Comptes Rendus*, IX, Congres. géol. internat., Vienna, 1904), deals mainly with the Bulgarian lands. *La Macédoine*, by J. Ancel (Paris, 1929), deals at length with the recent development of that area.

SECTION VI—EASTERN EUROPE

CHAPTER XXXII

GENERAL INTRODUCTION TO EASTERN EUROPE

THIS region of eastern Europe embraces about half the total area of the whole continent. It stretches from about 43° N. to 70° N., that is, approximately from the latitude of the French Riviera to that of the North Cape within the Arctic Circle, a distance of some nineteen hundred miles, and from about 23° E. to 60° E., a distance of some fifteen hundred miles, equivalent to the distance between the west of Brittany and Constantinople.

The greater part of this region forms a single morphological and relief unit, stretching from the Arctic Ocean in the north to the Black and Caspian Seas in the south, and from the Pripet Marshes and the Carpathian Mountains on the west, to the Ural Mountains on the east. As already indicated in Chapter I, it is mainly built up of unfolded sediments dating from Palæozoic to recent times, the whole forming a slightly raised peneplain of undulating or level relief. It is possible to traverse the whole region from north to south and from east to west along the great slow-moving rivers and their linking canals and not rise above a height of 650 feet. It thus comprises the greatest stretch of lowland in Europe and, indeed, one of the greatest in the world. The lowland is known geographically as the Russian Platform. For the purposes of this book, the bordering mountains will also be included within Eastern Europe.

Eastern Europe is markedly different from the rest of the continent in the absence of interior mountains which divide up the region into compartments, or which act as frontiers to climatic, political, or any other types of division. With such an extension in latitude, however, there must obviously be differences in climate, vegetation, and products from north to south, and, in fact, the vegetation of the Platform changes from tundra in the north, through forest in the centre, to steppe in the south; with minor elements on the margins. Both the climatic and vegetation divisions merge into one another almost imperceptibly and there is an absence

of the abrupt transitions and the sharp contrasts which are characteristic of western Europe. At the same time there is an absence of the fragmentary character and mosaic-like distributions which necessitate such detailed studies for the rest of the continent. Eastern Europe is built on broad, simple lines, so that one can perhaps compare it to an Egyptian pyramid, which though massive is easily described on account of the simplicity of its design, whereas western Europe has the intricacy of a Gothic cathedral.

Politically almost the whole of eastern Europe has been included within the frontiers of a single state since the end of the eighteenth century, and its boundaries practically correspond to what used to be known as Russia-in-Europe. After World War I (1914-18) a strip on the western side of the Russian Platform, comprising the independent states of Estonia, Latvia, and Lithuania, together with part of Poland and the Romanian province of Bessarabia, broke away from Russian control, but reverted to Russian rule during and at the end of World War II (1939-45). During the nineteenth century and the early part of the twentieth century, Russian rule had stretched westward beyond the limits of the platform to include Finland and much of the Vistula basin, but although the latter regions show differences of structure there are no marked changes of relief, vegetation or climate between the Platform and the adjacent morphological regions in these areas.

On the eastern and south-eastern sides the internal boundaries of the new Russia which emerged after World War I, that is, of the U.S.S.R. (Union of Socialist Soviet Republics), largely ignore the traditional division into Europe and Asia, a tendency which the older boundaries foreshadowed by taking the eastern boundary of one province right across the Ural Mountains and well into western Siberia. Both old and new boundaries emphasise the fact that the old division between Europe and Asia is here out of date. It never rested on any secure geographical base, for the lands of Russia east and west of the Ural Mountains possess the same type of relief and climate, have broad similarities of soil and vegetation, the same continental vastness and remoteness from useful seas; moreover, owing to the colonisation of the past three hundred years they now have the same Russian inhabitants. The continental features are naturally intensified as one goes east, but Russia-in-Europe more closely resembles western Siberia than it resembles central or western Europe. The Ural Mountains form a relatively low wall, easily crossed in many places, between two similar expanses of country. Nevertheless, it is true that they form a distinct morphological region of considerable individuality, since they are composed of folded and fractured strata belonging to the Hercynian system.

They therefore interpose a belt of rugged country, rising to heights of over 5,000 feet in places, between the plains which lie to east and west, and they also form an important watershed between the tributaries of the Volga and Pechora to westward and those of the Ob to eastward. It is interesting to note that the Bolshoi-Sovietski (Big Soviet) atlas of 1937 shows the Urals as lying just within the European section of the U.S.S.R., and they will be treated as belonging to Europe in this volume.

At the southern extremity of the Urals, low ridges, originally wooded, now mainly scrub-covered, run out into the steppes, becoming lower and narrower until they peter out completely. Between the Urals and the Caspian Sea lies a treeless plain, some 400 miles from north to south, across which nomadic peoples from Asia invaded Europe from prehistoric times until Ivan IV ("The Terrible") defeated the Tatars in the middle of the sixteenth century. There are here, in the Ural-Caspian Gap, no effective natural boundaries, though the Ural River used to be taken as the conventional dividing line between Europe and Asia. Asiatic influences are still much in evidence in the Ural-Caspian Gap, for the scanty population on the dry untillable steppe is of Asiatic stock and speech (Kirghiz), at least as far west as the lower Volga, a distance of some 250 miles west of the Ural River.

On its southern side the Russian Platform stops at the northern foot of the great Caucasus Mountains and at the small Yaila Mountains of the Crimea. Both these belong to the young folded mountains (Alpides) of Eurasia. The Caucasus Mountains, with their great diversity of peoples, religions, and languages, were conquered by Russia during the nineteenth century, while the Crimea with its Tatar elements came under Russian rule at the end of the eighteenth century. The old conventional boundary of Europe along the Manych depression, some 100 miles or so north of the Caucasus foot-hills, has no longer any validity, and the most useful frontier of eastern Europe coincides with that of U.S.S.R. *vis-à-vis* Persia (Iran) and Turkey, though some authorities go so far as to include Turkey as a European country.

It is noteworthy that over the whole of the vast area of the Russian Platform there are no physical obstacles, except low hills, rivers, swamps, and forests, and these were not sufficient to stop the expansion of the Russian state from its nucleus in the Moscow region, an area which Kropotkin, the famous Russian geographer, called Russia's "Ile de France." The rivers, indeed, far from being obstacles, were important highways. In contrast to western Europe there is found in eastern Europe a marked homogeneity, not only of structure and relief, but also of political organisation, and to a

less extent of peoples and languages. Only on the borders can much diversity be found.

STRUCTURE AND RELIEF OF EASTERN EUROPE

The Crystalline Base. It is believed, from the evidence of numerous borings, that the sedimentary strata everywhere rest on a base of ancient crystalline rocks, comprising granites, gneisses, and other similar igneous and metamorphic material. This crystalline floor is not, however, everywhere at the same depth below the surface; in some places it is several thousand feet below sea-level, in others it is either exposed or has only a very slight covering of superficial deposits. The crystalline floor emerges altogether from the sedimentary Platform in the north-west, in the Kola peninsula and Karelia, where it forms the eastern margin of the pre-Cambrian Baltic or Fennoscandian Shield (*see* Figs: 3, 141). The crystalline base also appears at or near the surface in southern Russia, in a belt some 550 miles long, running from north-west to south-east between the Dniester and the Don. It has been called the Azov-Podolian "shield" by some writers, but other authorities refer to it either as the Dnieper "horst" or Ukrainian "massif." It forms a plateau of no great height, some 600–1,000 feet in Podolia and Volhynia in the west, as also in the eastern section north of the Sea of Azov, but it sinks to less than 600 feet in the centre near Krivoi Rog, and also on both sides of the great bend of the Dnieper. The crystalline rocks of the Dnieper horst are in most places masked by thin layers of sandstone, limestone or clay which, in turn, are often hidden by lóss, but many of the rivers have cut down to the crystalline floor so that rapids have been formed, notably just below Dnepropetrovsk near the great bend of the Dnieper, on the River Don and on the River Dniester near Mogilev. It seems that the epeirogenic elevation of this horst is fairly recent, and has had a very considerable effect on the river system, particularly on the formation of the Polesian or Pripet marshes (*see* p. 453), and of course on the formation of the rapids mentioned above.

The great value of these ancient rocks lies in their mineral wealth, *e.g.* the iron of Krivoi Rog (about 60 per cent. of the ore mined in the U.S.S.R. in 1940) and the manganese of Nikopol are well-known assets of the Ukraine, while from the Russian portion of the Fennoscandian Shield come great quantities of apatite, used in making phosphatic fertilisers; nepheline, used in the aluminium and ceramic industries, as well as smaller amounts of copper, nickel, and iron.

There are other inequalities of the crystalline floor which affect the relief to some extent, notably a downfaulting in the Donetz region which preserved coal-measures of Carboniferous age, and incidentally the "roots" of an old folded system. Owing to the resistant nature of these "roots" the area appears on the surface as a plateau. Upthrustings are in evidence in the Kursk region, which serves to form the southern part of the Central Russian Uplands (*see* Fig. 141), and also in the Volga Heights which lie west of the River Volga between Kazan and Stalingrad, in the Stavropol plateau north of the Caucasus Mountains, and in the Ufa plateau west of the Urals. It would be a mistake to exaggerate the rigidity of the crystalline base, which shows faulting and warping at all geological epochs.

The Moscow Basin. The north-western part of the Russian Platform, between the Kursk-Voronezh horst in the south-west, the Fennoscandian Shield on the north-west, the Timan Mountains on the north-east and the Ufa horst on the east, is covered to a great depth with sedimentary deposits, mainly of Palæozoic age. This great accumulation was only possible because the crystalline floor continued to sag slightly throughout Palæozoic times, and indeed well into the Mesozoic period, for in the middle of the basin occur rocks of Triassic, Jurassic, and even Cretaceous age. Rocks of the Tertiary epoch are generally absent, showing that the land emerged from beneath the waters before this period. Extensive peneplanation followed this recovery, so that the younger rocks were stripped off the periphery, with the result that the rocks now outcrop in roughly concentric circles; the older rocks of Cambrian and Silurian age are on the margins, while the youngest, of Cretaceous age, are in the middle and reach the surface over large areas between the rivers Volga and Oka. These rocks are usually masked by superficial deposits of glacial drift which are sometimes of great thickness, but the underlying strata are of considerable importance, particularly with regard to the mineral deposits; for instance, the brown coal of the Tula district, the oil-shales from the Cambrian and Lower Silurian strata in Estonia, and also the bauxite of Tikhvin.

The nature of the underlying rocks also had more influence on the glacial deposits than might be suspected, for the very materials of which the drift is composed were derived very largely from the underlying sedimentary rocks. Moreover, in the process of denudation, scarps were often formed, and those which faced towards the north-west held up rock material in front of them when the ice-sheets were advancing, and also prevented the escape of melt-water when the ice-sheets were retreating.

The Tertiary Basin of the Southern Russian Platform. The southern part of the Russian Platform not only has a much more disturbed crystalline floor than the northern part, but over large areas Palæozoic strata appear to be absent and rocks of Mesozoic age rest directly on the old crystalline base. The Cretaceous system is well represented, and there is a great thickness of marine and lacustrine Tertiary strata. The latter are particularly important for their deposits of oil, which are widespread in various horizons: to the well-known deposits on the flanks of the Caucasus must now be added those of "The Second Baku," an extensive region stretching between the Urals and the Volga, and as far south as the Caspian Sea. It is clear that the main emergence of the land took place much later here than in the northern half of the Platform; in fact, the waters of the Caspian are believed to have spread far to the north and west, even in post-glacial times (*see* Fig. 141), but the bulk of the area seems to have become land just before the Ice Age began. Unlike the northern part of the Platform, the southern part was not covered by ice-sheets, except for two great "tongue basins," but received a mantle of löss, a fine wind-blown material carried outwards from the glacial deposits during interglacial periods and during the advance and retreat of the last ice-sheet. This löss conceals the minor inequalities of the surface except in the south-east which was covered by the waters of an extended Caspian Sea until geologically recent times.

Effects of the Ice Age. Although the main relief features of the Russian Platform are due to the solid geology, yet the detailed topography is chiefly due to events which took place during the Quaternary glaciation, when parts of the Platform were swept clear of soil, while others received a mantle of superficial deposits of various kinds.

The sequence of events was much the same as that already described in connection with the Germano-Polish lowland. The main centre of expansion of the ice-sheet was the Scandinavian highlands, though there were minor centres of dispersion in the Timan Mountains, the northern Urals, and Novaya Zemlya. The maximum advance of the ice-sheet probably took place here in the second glaciation stage (known as the "Riss" glaciation) which largely obscured the work of the earlier ("Mindel") glaciation. The "Riss" ice-sheet reached about as far south as Smolensk on the Dnieper, Kaluga on the Oka, and Gorki (Nijni-Novgorod) on the Volga, but sent two advanced tongues down the valleys of the Dnieper and Don, nearly as far as the great bends of these two rivers (*see* Fig. 140). It is significant that the Volga Heights and the Central Russian Uplands south of Kaluga were not glaciated;

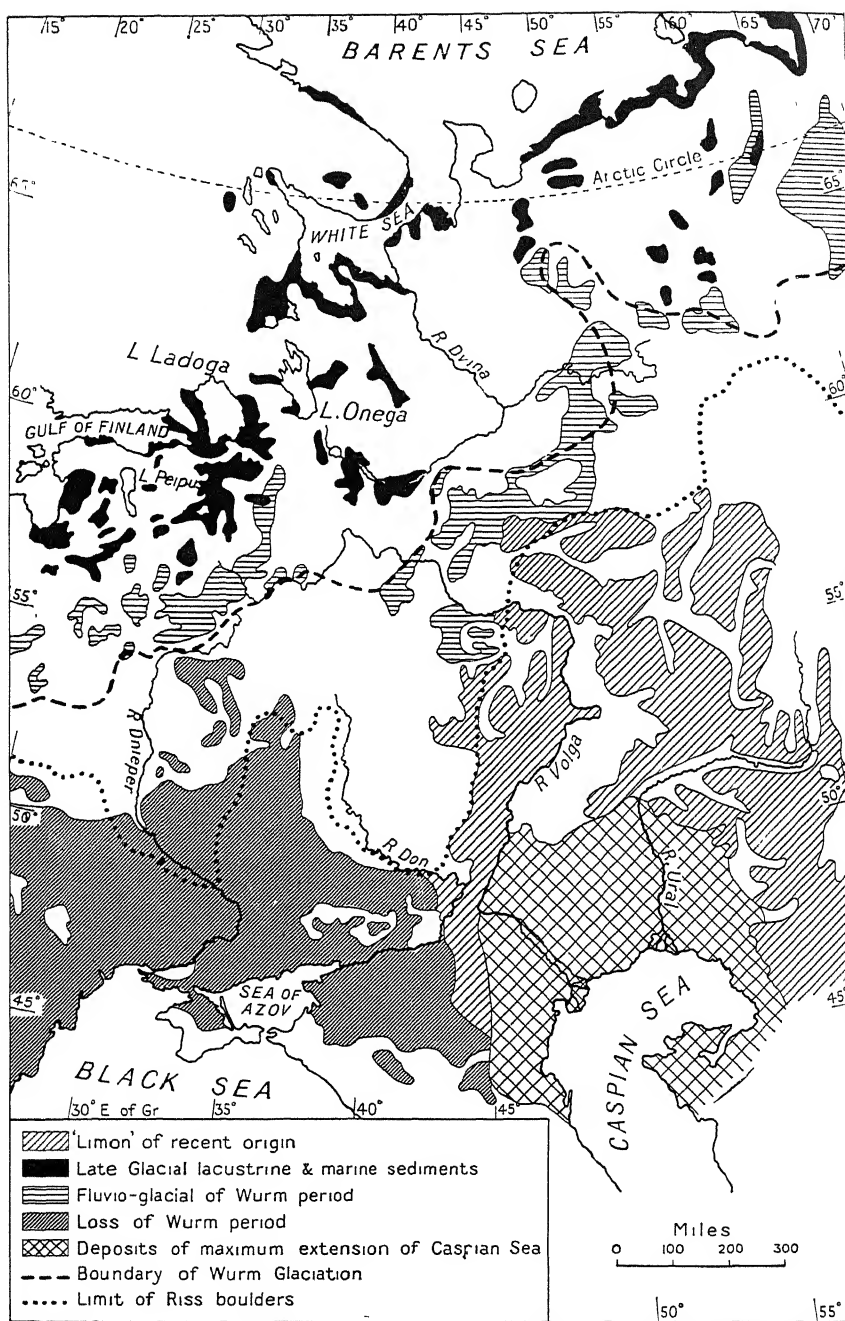


FIG. 140.—SOME GLACIAL FEATURES OF EASTERN EUROPE.

although only of modest height, they were sufficiently elevated to divert the ice-sheet, which was here probably fairly thin owing to the great distance from the centres of dispersion. The work of the "Riss" glaciation has been partially obliterated by morainic deposits and outwash sands from the latest ("Würm") ice-sheet in the north, and by deposits of wind-blown löss in the south, but its existence was detected by the presence of erratic boulders and stones. Moreover, the "tongue-basins," where the advanced lobes of ice formerly lay, still show traces of the former marshes which succeeded the lobes of ice, and still have rather poorly developed river systems. The results of the latest advance of the ice-sheet are still very visible. Its southern edge probably lay near Minsk and Moscow; farther eastward its limits are hidden in the northern forests, but probably lie along the watershed which separates the Arctic drainage of the North Dvina river system from the Ponto-Caspian drainage of the northern tributaries of the Volga (Vetluga, Kama, etc.).

The work of the ice-sheet may be broadly classified into three main types which may also be associated with actual space relationships:

(1) Erosion by the ice-sheets in the north-west (Finno-Karelia, the Kola peninsula, and a small part of the Baltic provinces).

(2) Accumulation under the ice-sheets in the northern part of the Russian Platform.

(3) Deposition by wind and water beyond the edges of the ice-sheets in the southern part of the Platform.

The Erosion Territory of the North-West. Fig. 141 shows the approximate boundary between the erosion territory and the accumulation territory. If this figure is compared with Fig. 3, it will be seen that this boundary almost coincides with the edge of the Fennoscandian Shield, for the very good reason that the ice-sheets stripped off the sedimentary rocks which are believed to have covered the crystalline shield at one time. The Kola peninsula and the northern part of Finno-Karelia show the same combination of barren rocks and lake basins which characterises Finland. Eskers, which are sandy ridges formed by sub-glacial streams, are also frequent, as well as confused masses of boulders, but ground-moraine of boulder-clay type is absent. Across the south-eastern part of Finno-Karelia, however, there is a great end-moraine, composed of boulders, rubble, sand, and gravels, which marked a period when the edge of the retreating ice-sheet remained stationary for a long time. The ice was far from being "dead," but relatively rapid movement of the ice was balanced by rapid melting along the

edges. This moraine, which is a continuation of the Salpausselka of Finland, runs in a north-east to south-west direction north-west of Lake Ladoga; a similar end-moraine runs south of the Shuya River between Lake Ladoga and Lake Onega. This picture is slightly blurred in Karelia by the late-glacial submergence which led to the deposit of marine clays in the low-lying areas. There are a large number of lakes, due to the erosion of rock basins, to tectonic faults, and to the great disturbance of the pre-glacial drainage.

The Accumulation Territory. The northern part of the Russian Platform shows glacial deposits which are similar to those of the Germano-Polish lowland, and particularly of the Vistula basin. For various reasons they have been studied in less detail, but in many localities it is possible to trace end-moraines as well as parallel fluvio-glacial valleys similar to the *urstromtäler* and *pradoliny* already described (see pp. 247-248.) The main end-moraines trend from north-east to south-west for the most part. The two head-waters of the River North Dvina, the Sukhona and the Vichегда, appear to occupy an ancient glacial valley, caused by the blocking of the north-bound drainage by the edge of the ice-sheet. Generally speaking, conditions were less favourable to the formation of well-marked end-moraines and parallel *urstromtäler* than in Germany. Towards its outer edges in Russia, the ice-sheet was a long way from the highlands of Scandinavia, where its plucking action was most intense, and it was moving over an area of low relief which offered little opportunity for glacial plucking. There was no obstacle comparable with the *Mittelgebirge* of central Europe to prevent the expansion of the ice-sheet southwards or to prevent the southward escape of melt-water. Except in Karelia and adjacent regions of the north-west, the load carried by the ice-sheet was derived from the sedimentary rocks of the Russian Platform itself, and these were fairly easily ground up into clay with a greater or smaller sprinkling of boulders according to the type of rock passed over. The proportion of fairly level clay-plains in Russia is therefore similar to that in Poland and greater than that in Germany; these plains may perhaps be compared with the boulder-clay region of East Anglia. However, "knob and basin" topography, as the Americans call it, is by no means absent, and is particularly well represented in the Valdai Hills. The hilly end-moraine type of scenery gives some variety to the level expanses which are so characteristic of the northern forested half of the Russian Platform. Small lakes also break the monotony, and are fairly frequent owing to the disturbance of the drainage in glacial times, while the same cause is responsible for the numerous

rapids on the streams of the north and on the tributary streams and head streams farther south.

Boulders are naturally most apparent towards the north-west, and these are particularly numerous where the advancing ice-sheet met a relief obstacle, though this was not necessarily of any great height. Thus the escarpment known as the "glint" which borders the Baltic coast, and sometimes coincides with the coastal cliffs, led to a marked accumulation of boulders below it on its northern side (see Fig. 141). Similarly, the ridge of Carboniferous limestone which forms the main core of the Valdai Hills arrested the progress of the ice-flow and the region is strewn with boulders. In some places extensive stretches of sand were deposited as outwash plains (*sandr*), and sand also predominates in the *urstromtäler*. The distribution of the main areas of these fluvio-glacial sands is shown in Fig. 140. Normal subaerial denudation has not had sufficient time to remodel the surface features, except on the smallest scale, though the shallow late-glacial lakes have often been drained wholly or in part, and now form swamps or cultivable peaty bottom-lands.

The Deposition Territory of the Southern Part of the Russian Platform. South of the edge of the last ice-sheet ("Würm" glaciation) a large part of the surface is covered by a mantle of löss or *limon*. The latter is believed to have been derived from löss, as its chemical composition is very similar, but unlike the löss it is more or less stratified and therefore appears to have been re-sorted by the action of water. The *limon* takes its name from similar deposits which are so characteristic of north-eastern France. The extent of the deposits of pure löss is shown in Fig. 140, from which it will be seen that in some places, particularly in the middle Dnieper region, it covers the glacial drift laid down during the period of maximum glaciation. The *limon* gives rise to soils which are usually just as fertile and just as free from stones as the löss, while the alluvium of the flood-plains along the rivers is also very fertile as it is mainly derived from these deposits. On the north-western side of the *löss-limon* belt, however, there are extensive areas of sand, representing outwash plains and *urstromtäler*. These occur particularly in the upper Dnieper area, north of Kiev and east of the upper Don, the two depressions here forming easy ways of escape for the melt-water of the most recent ice-sheet. Throughout both the *löss-limon* region and the sandy tracts, stones are generally conspicuously absent but, in a few areas, boulders of the maximum glaciation can still be found on the surface, as in Volhynia, west of Kiev, where enough stones were found to pave part of the old highway between Kiev and Brest-Litovsk, while the houses actually have corner-stones, a rare occurrence in southern Russia. Outside

the glaciated area the solid rock comes near the surface in the granites of the Dnieper Heights, but generally speaking there is a remarkable lack of building or constructional stone of any kind in southern Russia.

To the south-east of the *löss-limon* belt there is a larger expanse of superficial deposits of different type. These are the lacustrine sediments laid down beneath the former extension of the Caspian Sea, which at one time spread as far west as the scarp of the Ergeni Hills and as far north as shown on Fig. 140. These sediments consist of clays and sands often impregnated with salts, as semi-desert conditions prevail owing to the low rainfall. The sand in many places forms shifting sand-dunes.

The Marginal Mountains. The old crystalline base of the Russian Platform was too rigid to buckle to any extent, though it experienced faulting and warping, and in fact behaved like the Fennoscandian Shield of which it is the hidden continuation. Round its margins less resistant rocks were subjected to intense folding and were built up into mountain ranges of various ages. Of these the Timan range is believed to be the oldest, though it has doubtful tectonic affinities, the Urals belong to the Hercynian system of folding which took place at the close of Palæozoic times, and the Caucasus and Crimean Mountains to the Alpides system of Tertiary times. In the south-west, the Carpathian Mountains, a small part of which now lie within the U.S.S.R. (as a consequence of World War II), may be included among the Alpides. The Donetz folding, though leaving little impression on the landscape, belongs to the Hercynian system.

The Timan Mountains, whose folding is possibly Caledonian (see p. 3), have undergone such prolonged denudation that they exceed 1,000 feet only at one or two points, and they appear as discontinuous lines of rounded hills which, however, are often sufficiently high to rise as tundra-covered moorlands above the surrounding forest. The remains of five parallel ranges have been traced.

The Ural Mountains are of the same geological age as the Massif Central of France, the Erzgebirge, Harz Mountains, etc., and have undergone similar peneplanation and rejuvenation. The range stretches for over 1,400 miles from north to south, and falls naturally into three sections, a northern, central, and southern. The northern section, which is about 900 miles long and lies north of latitude 58° N., is little known, but summit levels appear to average 2,000 feet or so, while heights of 5,000 feet and over are occasionally reached. It varies in width from about 50 to 75 miles, and consists of several parallel ranges; it was extensively glaciated during the Quaternary Ice Age and shows U-shaped valleys and many "cirques," thus resembling the highlands of Norway and Scotland. The southern half of this section is forest clad, and it forms a hunting ground for

the tribes of the north, but it is devoid of permanent habitations, except in the extreme south where minerals are worked. Further geological investigations may reveal the presence of minerals farther north. The central portion of the Urals, which is only about 150 miles from north to south, is the lowest section, and partly for that reason is particularly important. Its rounded massifs seldom exceed 1,200 feet in height, and its low passes were utilised by the Russian pioneers of the sixteenth century on their way to Siberia. The southern Urals are about 350 miles long and attain a width of some 160 miles in the middle. They consist of several parallel ranges which fan out southwards from the middle portion, but become lower as they do so. The greatest height of the southern Urals occurs at Yaman-Tau (5,610 feet) in the most westerly range, but the mountains have everywhere the characteristic Hercynian form of long, flat-topped ridges, usually forest-clad to their summits, except where they have been cleared to provide charcoal for the iron industry. Movement is fairly easy here from north to south along the longitudinal valleys, but by no means easy from east to west, the railway from Ufa to Chelyabinsk having to climb to 1,950 feet just east of Zlatoust. Farther south, in the region of Magnitogorsk, not only are the ranges lower, but they are separated by wide and shallow valleys, there is little timber, and communications are much easier.

The core of the Urals is largely composed of very highly disturbed metamorphic rocks with igneous intrusions, with which are associated a great range of metals; iron-ore, copper, gold, nickel, chrome, manganese, platinum; in fact, it is difficult to mention a mineral which is not found in the Urals. Precious stones, such as amethyst, topaz, and emerald, occur in considerable quantities. The sedimentary rocks on the flanks of the Urals are rich in other minerals, especially coal, oil, and potassium salts.

The Caucasus Mountains. Some 900 miles in length, with some ten or eleven peaks higher than Mt. Blanc, the lofty snow-clad Caucasus offer a splendid example of the Alpides system of folding. In many important features, however, they resemble the Pyrenees rather than the Alps; first, their straight alignment is in contrast to the Alpine arc, secondly their transverse edges on east and west are washed by seas; thirdly, to north and south they are flanked by depressions which stretch from sea to sea. Consequently, though difficult to cross, their flanks can easily be turned, so that they lack the busy, well-worn routes and passes of the Alps.

Mountains of the Crimea. These mountains, which border the south-eastern coast of the Crimean peninsula, are only about 100 miles long from north-east to south-west and some 25 miles wide.

Their structure is quite simple. They represent the north-western flank of a denuded anticline whose south-eastern flank has foundered beneath the Black Sea; the axis of this anticline lies approximately along the present coastline. The vault of the anticline has been denuded to expose Jurassic limestones and shales along the coast between Balaklava and Feodosia, and these are succeeded to north-westward by Cretaceous measures (chalk and conglomerates), and these again by Tertiary limestones, marls, and sandstones. The harder layers, particularly the limestones, form well-marked scarps facing south-east, between which lie plateaus and depressions. The fracture line along the coast was accompanied by Tertiary volcanic activity, the remnants of which can be seen in numerous rugged hills.

Summary. A summary of the physical regions of European Russia within her 1938 frontiers is given in Fig. 141, which is adapted from the Bolshoi-Sovietski (Big Soviet) Atlas, 1937. The following notes explain the numbers given in the map and also afford a résumé of this chapter.

I. Kola peninsula and Karelia. An ancient crystalline plateau, cut up by faults, with evidences of recent glaciation.

II. Regions in which relief is mainly conditioned by morainic deposits, but influenced by pre-glacial physique.

III. Low-lying regions on the edge of the Quaternary glaciation; *sandr*; sandy, lacustrine and marshy stretches, sometimes with dunes. Includes the Don-Oka glacial tongue-basin.

IV. Upland regions with strongly eroded relief; mainly covered with *löss* or *limon*.

V. Plains; mostly outside the glacial zone, but excluding VI.

VI. Recent plain of Caspian depression.

VII. Timan Mountains, Donetsk plateau. The former is composed of low ridges, and vestiges of old ridges; the latter forms a rolling plateau, deeply dissected by the river network.

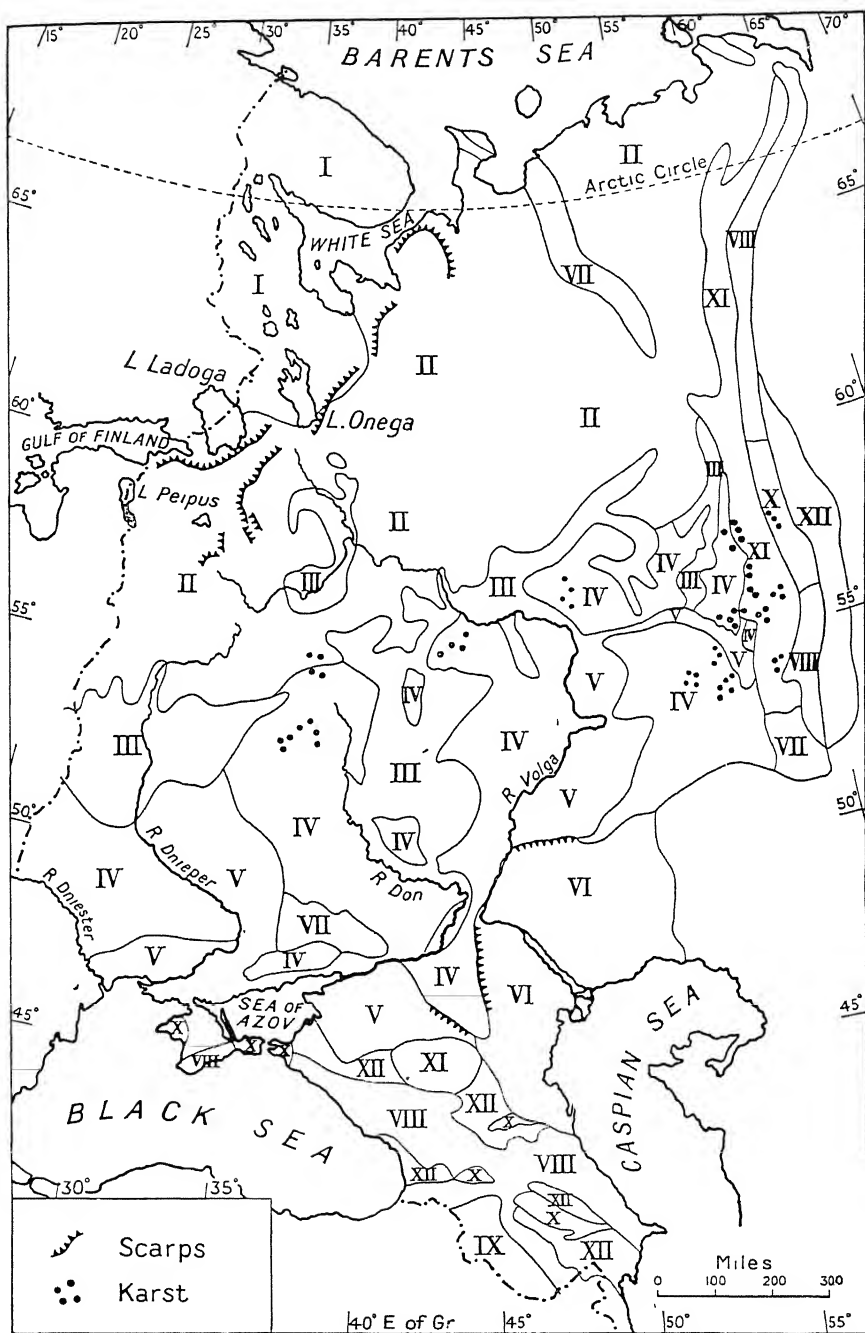
VIII. Mountainous districts; relief mainly due to tectonic folding, faulting and epeirogenic elevation. Includes parts of Urals, Caucasus, and Crimean Mountains.

IX. Volcanic mountains of Armenia.

X. Low mountains and hills; relief mainly conditioned by tectonic processes.

XI. Foot-hill regions; relief showing erosive forms due to river action.

XII. Alluvial and fluvio-glacial plains along foot-hills of Caucasus and the abraded platform at eastern foot of Urals.



[Adapted from the Bolshoi-Sovietskii Atlas

CLIMATE AND VEGETATION

The Tundra Zone. This occupies most of the territory north of the Arctic Circle, except in the Kola peninsula, where the strip of tundra along the Arctic Ocean is comparatively narrow, though

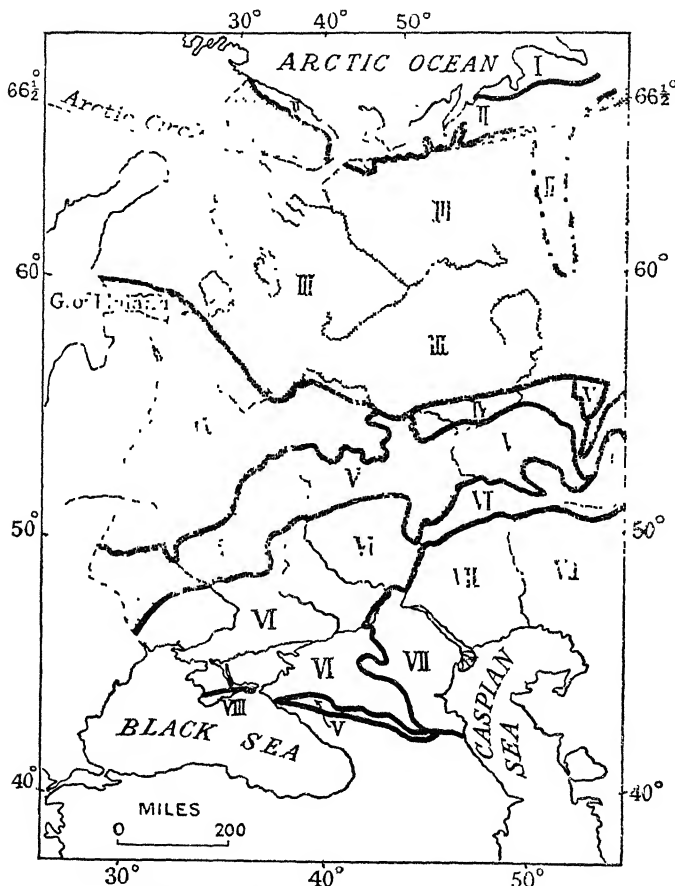


FIG. 142.—MAJOR VEGETATION ZONES OF EUROPEAN RUSSIA.

I, Tundra; II, Forest-Tundra; III, Coniferous Forest; IV, Mixed Coniferous and Deciduous Forest; V, Wooded-Steppe; VI, Steppe; VII, Semi-Desert; VIII, Mediterranean.

tundra occurs above the forests on the mountains of the interior. The tundra sends tongues southward into the forest zone along the Timan and Ural Mountains, roughly as far south as 63° N. in the latter.

Winters are long and severe, with both soil and subsoil frozen, and with snow covering the ground for about eight or nine months. Cold winds blow with enormous force. Summer is short, being limited to about six weeks, and although the summer days are very long, frosts may occur. The precipitation is spread evenly throughout the year, and clouds cover the sky almost all the time; although the total amount of precipitation is slight (8 to 12 inches per annum), even this small amount hardly evaporates at all, but remains on the land as shallow stretches of water which often become transformed into marshes. Consequently, mosquitoes are very troublesome in summer.

Coniferous and Mixed Forests. **The Taïga.** The coniferous forest zone in eastern Europe extends farther south than it does in central and western Europe. Its southern margin dips from the neighbourhood of Leningrad (60° N.), south-east to the neighbourhood of Kalinin (Tver) on the Volga ($56\frac{1}{2}^{\circ}$ N.), and thence to Kazan (about $55\frac{1}{2}^{\circ}$ N.), in correlation, no doubt, with the dipping of the winter isotherms towards the south-east. Winters are both long and cold, with six or seven months in which the mean average temperature is below freezing, with snow lying on the ground for about five and a half months in the south and for seven or eight months in the north. The thaw sets in during late April or early May, so the growing season is short, for the mean average temperature drops below freezing in October even at Kazan. The mean average summer temperatures are fairly high, e.g. 60.4° F. at Archangel, 67.5° at Kazan for July, but night frosts are liable to occur even in the warmest month.

A marked feature of the vegetation of the Taïga zone is the development of peat bogs (*see* p. 29).

The Sub-Zone of Mixed Forest. The proportion of deciduous trees in the mixed forest zone remains small, and they form important patches only in the southern portion of the zone. The chief deciduous trees are the lime, oak, elm, and maple. It may be asked why this zone need be taken as anything more than a transition belt between the Taïga and the purely deciduous forest. The answer lies partly, (*a*) in the width of the belt, some 600 miles from north to south along the meridian of Leningrad (30° E.), whereas the zone of purely deciduous forest is considerably narrower and much intermingled with steppe, and (*b*) in the great importance of this zone in the human geography of Russia. The main portion of this sub-zone is triangular in shape, with its northern limit running from Leningrad to Kazan and its southern limit from Zhitomir, *via* Kiev and Ryazan to Kazan, which forms the apex of the triangle. It continues east of the Volga only as a narrow strip. On the west,

it merges, of course, with the great zone of mixed forest which covers Europe from the 60th parallel of latitude to the head of the Adriatic Sea (c. 46° N.). This triangle or wedged-shape zone of mixed forest is the heartland of Russia, the only part suited to

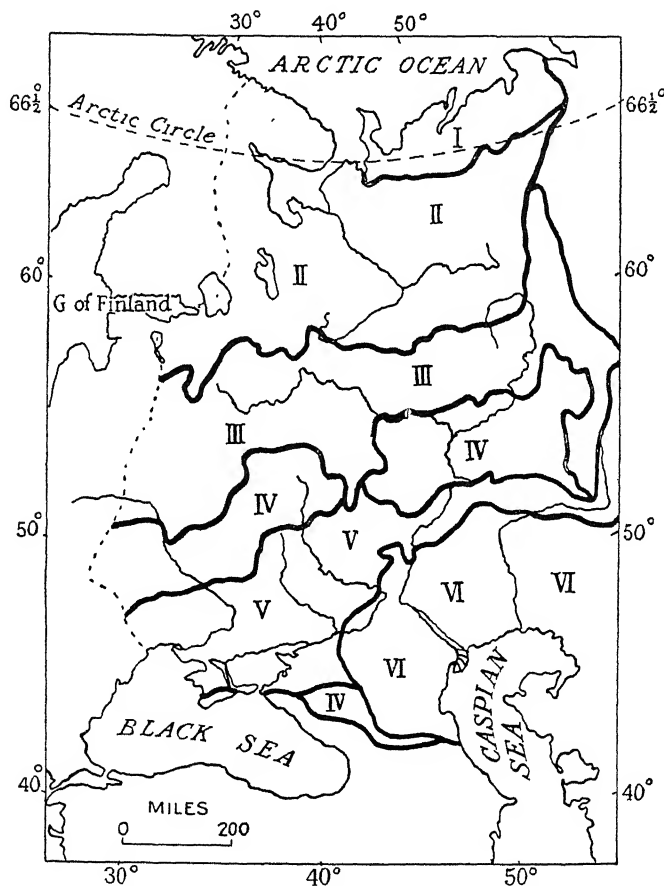


FIG. 143.—MAJOR SOIL ZONES OF EUROPEAN RUSSIA.

I, Tundra and bog region; II, Podsol-swamp region; III, Podsolised forest region; IV, Podsolised chernozem; V, Chernozem; VI, Chestnut and brown soils.

agriculture in early days; in terms of human geography the history of Russia may be described as the advance of the agriculturalists of this zone against the hunters of the northern Taiga and the nomads of the southern steppes.

Climatically the region is marked off from the Taïga by its longer growing season, and particularly by a longer period free from killing frosts. The duration of the snow cover is still long, varying from about 160 days at Leningrad to 80 days at Kiev. At Moscow there are five months with mean average temperature below freezing, and at Kiev four months; the Neva, the Moskva, and the Oka all usually freeze before the end of November and remain frozen until the middle of April. Summer temperatures, on the other hand, are high for the latitude compared with those of central and western Europe; e.g. Moscow, has a mean average July temperature of 66° F. and Kiev of 66·6° F., and although the precipitation is higher than in the Taïga, the greater insolation dries up the land in summer and in consequence there is much less tendency to peat-bog formation, except in low-lying ground which is by nature badly drained.

The Steppes and Wooded-steppes. South of the mixed forest zone there is a large area which is somewhat loosely termed "the steppe." Actually it consists of three zones as far as vegetation is concerned, and this difference in vegetation-cover reflects slight but significant differences of climate.

In the greater part of the vast steppe area, trees will not grow except along water-courses or where water is supplied artificially. An exception occurs, however, in the northern fringe, where bordering the zone of mixed forest is the wooded steppe, or parklands.

The Wooded-steppe. This area, which was once covered by steppe grasses and associated herbaceous vegetation, was invaded by deciduous trees in post-glacial times. Oak, lime, maple, and ash are the predominating trees, with an undergrowth of shrubs or smaller trees, such as the spindle, cherry, hazel-nuts, and dog-roses, etc. The deciduous trees were able to invade this area owing to the smaller liability to drought than in the true steppe. Not only is the precipitation actually heavier (generally over 16 inches), but it tends to be spread out more evenly in the year, and there is less evaporation than farther south owing to the lower summer temperatures and somewhat cloudier skies; moreover, the thicker snow-cover moistens the ground more thoroughly. The wooded steppe appears always to have had considerable clearings in which steppe vegetation flourished. These were known as *polia* or *polyany*, meaning meadows or fields (*cf.* the *polja* of Yugoslavia). Owing to the extension of cultivation into this belt, few woods now remain.

The Tillable Steppe or Prairie. The tillable steppe or prairie corresponds with the distribution of the true *chernozem* or "black earth." The annual precipitation here is usually less than 16 inches,

but more than 10 inches, with a maximum in spring and early summer. Winter precipitation occurs in the form of snow, but towards the drier margins tends to be not sufficiently thick for adequate ground protection. In summer temperatures are high (e.g. Odessa 72.7° F. and Saratov 72.1° F. in July), and evaporation exceeds precipitation. In consequence the area is generally treeless.

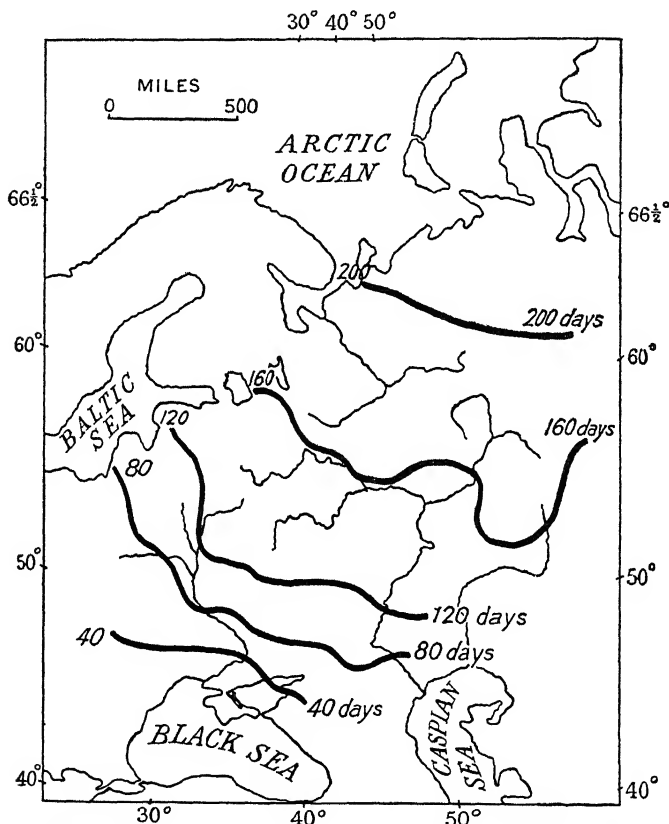


FIG. 144.—AVERAGE DURATION OF SNOW-COVER IN EUROPEAN RUSSIA.

The Non-tillable Steppe. In eastern Europe the non-tillable steppe is found round the northern end of the Caspian Sea, and east of the Ergeni Hills, where the annual rainfall is less than 10 inches. This region is sometimes known as semi-desert, but most of it carries seasonal grazing, though there are some completely bare patches which increase in frequency and size towards the south-east. The humus content is moderately high and the soils are therefore

relatively fertile under irrigation. Unfortunately a good deal of the surface is impregnated with salts of various kinds, and though the salt-loving vegetation which grows on some of these stretches is appreciated by livestock, completely bare salt pans cover considerable areas.

A good deal of confusion is caused by the word "steppe" being applied both to the tillable as well as to the non-tillable grasslands. No doubt before the days of agricultural expansion the difference was not so noticeable as it is to-day, but a fundamental contrast in land-use exists between the two types. In the following chapters, to avoid confusion, the term prairie will be used for the tillable steppe south of the wooded-steppe, the term semi-desert for the non-tillable steppe.

REFERENCES

États de Baltique, Russie, Tome V of *Géographie Universelle*, by P. Camena d'Almeida (Paris, 1932), gives a regional account, but is already considerably out of date. The following may also be usefully consulted: *L'U.R.S.S., Haute Asie, Iran*, by P. George (Paris, 1947); *The U.S.S.R., a Geographical Survey*, by J. S. Gregory and D. W. Shave (London, 1944); *Soviet Lands*, by G. D. B. Gray (London, 1947); *The U.S.S.R., an Economic and Social Survey*, by S. P. Turin (London, 1944); *The Basis of Soviet Strength*, by George B. Cressey (New York, 1945); *Les Régions Naturelles de L'U.R.S.S.*, by Leo Berg (Paris, 1941); *The Soviet Union: The Land and its People*, by Georges Jorré, translated by E. D. Laborde (Longmans, London, 1950); and *Géographie Physique et Economique de L'U.R.S.S.*, by A. Fichelle (Paris, 1946); also *The Geography of the U.S.S.R.*, by T. Shabad (University of Columbia Press, 1951).

The Bolshoi-Sovietski Atlas (2 vols., Moscow, 1937) is a mine of information, but its letterpress is in Russian only. A translation of the titles and key by George B. Cressey is obtainable.

THE NORTHERN LANDS OF THE U.S.S.R.

THE northern lands of Tundra and Taïga are mainly non-agricultural, with a considerable percentage of their scanty population speaking languages belonging to the Finnish group. For these reasons they stand apart from the land further south, though they have been important to Russia on account of the ports, of Archangel since mid-sixteenth century, and of Murmansk in recent years. In the past four centuries there has been considerable Russian penetration.

The whole area may be sub-divided into two major sub-regions:

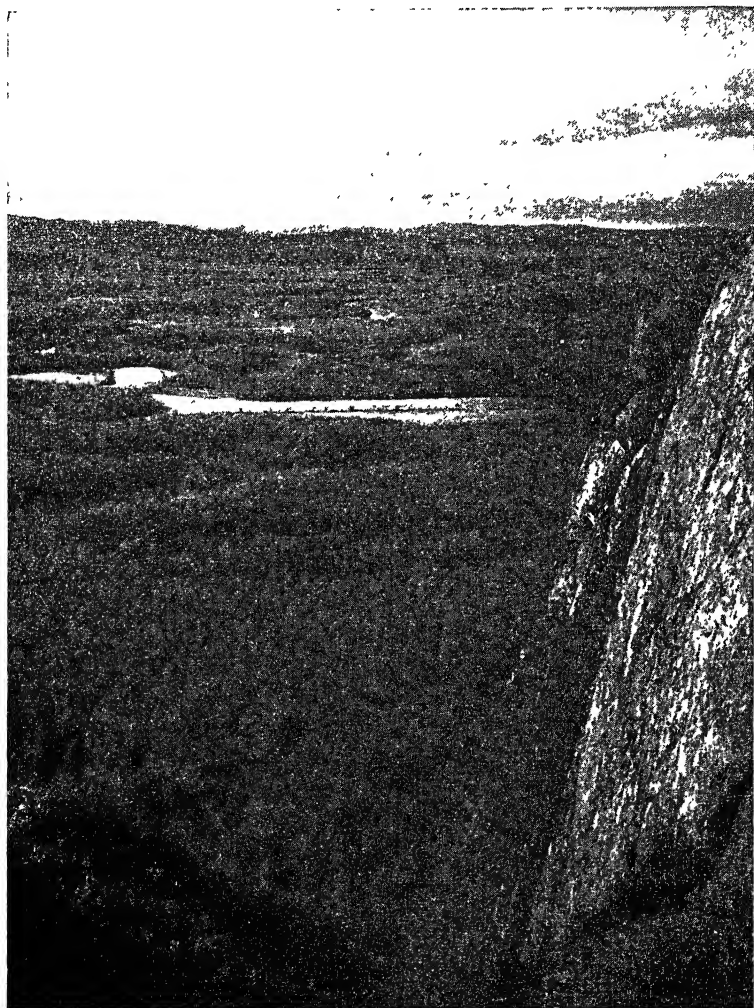
(A) The Kola peninsula and Finno-Karelia on the Fennoscandian Shield.

(B) The northern part of the Russian Platform, draining towards the Arctic and White Seas.

A. The Kola Peninsula and Finno-Karelia. The Kola peninsula consists mainly of a dissected plateau formed of gneiss and granite, with rounded forms predominating. Recent maps issued by the U.S.S.R. give the plateau a greater average elevation than did earlier maps based on incomplete surveys, and most of the land appears to be between 600 to 1,000 feet high, with the Khibin Mountains rising to over 4,000 feet. The northern shore of the peninsula lies just within the Tundra belt; the coniferous forest farther inland is poor and thin, and peters out at an elevation of a few hundred feet. Consequently the timber industry is only poorly developed, while agriculture is equally unimportant, since the surface was largely swept bare of soil by the ice-sheet, the low-lying regions are often lake-filled or swampy, and the scanty soil is poor and acid. The short growing season renders even the hay crop very precarious. Until the war of 1914-18 the peninsula was largely the domain of some 2,000 Lapps, who lived a semi-nomadic existence following their reindeer, with fishing to supplement their food supply, together with immigrant Finnic-speaking Zyrians, and a sprinkling of Russian and Norwegian fishermen. It is true that the Russians of Novgorod had explored this area in search of furs and had founded small settlements (*e.g.* Kola) before the fifteenth century, but the furs were neither so good nor so plentiful as those of the Taïga farther east, and there was nothing to induce the Russians to settle here.

The need to bring in supplies from Great Britain during the war

of 1914-18 marked the beginning of a great change in the Russian attitude towards the peninsula. Although Murmansk lies so far



[Courtesy "Finland Travel"]

FIG. 145.—ARCTIC FORESTS, IN THE PETSAMO AREA, FORMERLY FINNISH, NOW WITHIN THE U.S.S.R.

north (69° N.) it can be used throughout the winter, owing to the Gulf Stream Drift which hugs the shore. The Kandalaksha-Murmansk railway utilises the depression in which lie Lake

Imandra, the Kola river, and lesser rivers and lakes, and it is in about the same latitudes as the Scandinavian railway from Gellivara to Narvik. In spite of the railway, however, Murmansk was only a small place of some 8,800 people in 1926, but by the next census (January, 1939) it had leaped in numbers to 117,000, while the peninsula could boast an entirely new township, that of Kirovsk, with 128,000 people. It is significant, however, that the rural population remained extremely scanty; only 46,000 people in an area of 54,000 square miles, which means that most of the peninsula is uninhabited. Tillage is carried on solely to supply the port of Murmansk and the mining settlements with potatoes and fresh vegetables.

Apart from Murmansk, the main importance of the Kola peninsula lies in its mineral wealth, and also in its water-power. Kirovsk, east of Lake Imandra, is the main centre for the mining of apatite and nepheline. Fertilisers using the apatite are manufactured at Kirovsk, while aluminium from the nepheline is manufactured at Kandalaksha. A new mining township called Monchegorsk (30,000) was founded in the late 1930's to work the copper-nickel ores. Mica deposits also occur. The Kola peninsula claims to have the most northerly electric grid transmission system in the world, utilising powerful falls on the Rivers Tuloma and Niva. The section of the railway between Kandalaksha and Murmansk is now electrified.

While the Kola peninsula bears a strong resemblance to Norwegian Finnmark and Finnish Lapland, Finno-Karelia greatly resembles the central lake section of Finland. This likeness is only increased by the inclusion within Russia's frontiers of a strip of country which was Finnish before 1940. Even without this recent addition, 40 per cent. of the inhabitants spoke a non-Russian language, either Finnish or the similar Karelian. The Russian settlers entered Karelia chiefly from the White Sea, mainly on account of the excellent fisheries along the Pomorie¹ coast, south of the Kem River.

Finno-Karelia is distinguished from the Kola peninsula by the excellence of its forests and the greater abundance of lakes. It resembles the peninsula in the importance of its routes and the abundance of water-power, but agriculture is not much more important, only three per cent. of the land being cultivated, and this mainly for hay. Sixty per cent. of the population is engaged in lumbering. Mining, principally for copper, is of increasing importance.

The routes on which the exploitation of Finno-Karelia chiefly depend are the Leningrad-Murmansk railway and the great water

¹ The name means, "by the sea."

route, which, *via* lakes Vig, Onega, and Ladoga, and various rivers, almost links the White Sea to the Baltic. The water route, with its portages, had been in use from the fifteenth century, but the construction in the 1930's of the so-called Baltic-White Sea canal, linking the White Sea with Lake Vig, and the latter with Lake Onega, enabled merchant vessels to ply between the two seas, and to relieve the railway of bulky freights, such as timber, apatite and granite. Karelia supplied about one-fifth of the total export of sawn timber from the U.S.S.R. in the 1930's, and there are factories for manufacturing cellulose and paper. The output from the formerly Finnish mills (on the western side of Lake Ladoga, and at Viipuri and its hinterland) was even larger, however.

There are only two towns of any size. Petrozavodsk ("Peter's Mill"), founded by Peter the Great on Lake Onega, was the only industrial centre of the north-west in pre-revolutionary times. It manufactures iron and steel goods from local ores, and is an important centre of the timber industry. It grew from 27,000 to 70,000 between 1926 and 1939. Viipuri (about 74,000) is by far the oldest of the Finno-Karelian towns, having been fortified by the Swedes at the end of the thirteenth century. Through its connection *via* the Saima canal to Finland's interior system of lakes and other waterways, it became a great timber exporting centre, but it has lost a good deal of this hinterland through its inclusion in the U.S.S.R.

B. The Northern Drainage Area of the Russian Platform. This vast area of over 600,000 square miles comprises about one-third of the total area of European Russia, that is to say, it is three times the size of France and five times the size of the British Isles. Yet its total population was only about $4\frac{1}{2}$ millions in 1939 or less than seven per square mile. This population density may be contrasted with 29 per square mile in Finland (census 1940), which lies in roughly comparable latitudes, but has a much more favourable sea-frontage. The rôle of this northern area in Russian economy may be summed up by saying that 77 per cent. of the surface is forest-covered, 20 per cent. consists of Tundra, and only 3 per cent. is under cultivation.

The relief of the region is low and monotonous, mainly below 600 feet, except in the Timan Mountains. Minor inequalities of the land are concealed in the interminable forests, but there are many swampy and boggy depressions. The main water-parting between the rivers draining northwards to the Arctic and those draining southward to the Caspian Sea is a long low ridge running north-east to south-west, which appears to be a terminal moraine

left by the great ice-sheet. It is commonly taken as the southern boundary of the northern region.

The chief means of communication is still by water, for there are few railways and fewer roads in the region. The Northern Dvina river system has about 3,000 miles of navigable water, and the Pechora about 1,000 miles, but their usefulness is unfortunately much curtailed by their northerly latitude, Archangel (*c.* 65° N.), near the mouth of the Northern Dvina, being frozen up for seven months on an average, while the mouth of the Pechora is often frozen or seriously impeded by ice for about nine months in the year. Freezing is less severe in the upper courses of the rivers, so that internal navigation begins some time before the mouths are open for the export trade.

This northern drainage area may be subdivided into (1) the Tundra, (2) the Taïga, and the latter into (*a*) the west, or Archangel region, (*b*) the north-east, or Pechora-Mezen area, (*c*) the south-west, or Vologda region. This subdivision depends on considerations of position and of the stage of economic development rather than on physiographic grounds.

The Tundra. Practically all the land north of the Arctic Circle belongs to the cold desert, or Tundra. It begins just north of Mezen on the river of the same name, and broadens eastward, owing to the north-easterly trend of the coastline. The scanty population, consisting of Samoyeds and Zyrians, numbers only 17,000, so there are at least five square miles to each person. The reindeer-keeping Samoyeds live on the fringes of the Taïga in winter and engage in trapping, but move to the coasts in summer. They were falling an economic prey to the Finnic-speaking Zyrians or Komi, who had developed marked commercial aptitudes in modern times, and were buying up reindeer herds and grazing rights. It remains to be seen whether the recent State establishment of collective reindeer farms, schools, and medical stations will arrest the decay of the Samoyeds who, unlike the Zyrians, are an intrusive Mongoloid people of Ugrian speech.

The Taïga. It is only within the last 100 years or so that the northern forests have been valued for their timber. Before that time furs, and to a lesser extent salt, were the only commercial products. The people of Novgorod and Muscovy looked upon the region much as the Hudson Bay Company looked upon the northern forests of Canada, and small fur-trading posts were established throughout the region at suitable collecting points along the rivers.

(*a*) *The Archangel Region.* The discovery by the English in the sixteenth century of the White Sea route to Russia led to a

great increase in the importance of the western part of the Taïga, and especially of the Northern Dvina river system, for the only practicable route between Archangel and Moscow was *via* the Northern Dvina and its tributary the Sukhona, and thence *via* the Vologda tributary of the latter. With the opening of the Baltic route by Peter the Great in the early eighteenth century the Archangel route was neglected, until the world demand for timber became so great that it could not be met by more accessible supplies. Archangel grew from 18,000 in 1900 to 77,000 in 1926, and 281,000 in 1939, and the town was second only to Leningrad as an exporter of timber. It has various industries, chiefly connected with wood, such as sawmills, and the manufacture of plywood, pulp, and paper. The Archangel region was connected by rail to the agricultural regions of the mixed forest belt at the end of the nineteenth century, and a direct line runs from north to south, linking Archangel with Vologda, and thence to Moscow.

Apart from the land near the navigable rivers and the railway line, the forest still retains much of its primeval character. The average population density of only five per square mile means, in fact, that large tracts of country are completely uninhabited. The rural population, apart from being engaged in lumbering, carries on subsistence agriculture, growing some rye, oats, barley, and flax, and rearing cattle in the natural hay meadows. There is an abundance of game birds and fresh-water fish.

(b) *The Pechora-Mezen Area.* The forested portion of the Pechora basin, together with the upper Vichегда and Mezen basins, and the Timan Mountains, lie in the Komi A.S.S.R. This region, which is as large as the British Isles, is remarkable for its low density of population, only two per square mile. It may be looked upon as the most inaccessible part of Europe, for its rivers lack the canal links with central Russia which have been made in the western Taïga, and until the 1940's it had no roads or railways. Even the timber industry is not developed and the scanty population carries on subsistence agriculture and commercial trapping. The people are Finnic-speaking, but have adopted Russian culture. Urban population numbered only 29,000 in 1939, and was mainly concentrated at the administrative centre of Siktyvkar (formerly Ust Sysolsk), an old settlement on the River Vichегда in the extreme south-west of the region. The recent discovery of oil and coal in the upper Pechora basin, along the western flank of the Urals, has aroused much interest; the coal was actively exploited during World War II, a railway being constructed for that purpose to Vorkuta.

(c) *The Vologda Region.* With 28 people per square mile, this is the most developed part of the northern forest, but it is not, in fact,

situated very far north, Vologda ($59^{\circ} 30' N.$) being in the latitude of Stockholm, and Kotlas ($61^{\circ} N.$) in that of Tampere. The southern part of the region may be regarded as transitional between the Taïga and the mixed-forest zone of the Moscow region. Agriculture has been important here for a long time, and many of the settlements are centuries old. Vologda (95,000)¹, at the head of navigation on the Northern Dvina system of waterways, is the most important town, and was one of the chief points on the old Moscow-Archangel route, as its wealth of sixteenth and seventeenth century architecture testifies. Nowadays, as the crossing-point of the Leningrad-Perm railway with the Moscow-Archangel line, its nodal position is enhanced. It is the collecting centre for the market produce of a large area, with flax, linseed, oats, hemp, butter, and eggs as the main commodities. Smaller urban centres are: Velsk, with rail connection to the Vologda-Archangel line; Kotlas, on the Northern Dvina, with rail connection south to Kirov (Vyatka), both centres of the timber industry; Ustyug at the junction of the Yug and Sukhona Rivers; and Solvychegodsk, at the junction of the Vichегда and Northern Dvina, whose salt-pans founded the fortunes of the famous Stroganov family. The three last-named towns were important points on the old "fur route" to the Pechora basin and Siberia.

¹ Population figures are from the Census of 1939 unless otherwise stated.

THE CENTRAL ZONE OF MIXED FORESTS

THIS triangular area is widest in the west where it stretches for some 600 miles from the Gulf of Finland in the north to Kiev in the south, but it tapers to a point in the east near Gorki (Nijni Novgorod) at the junction of the Volga and Oka rivers. Within this area the Russians developed their characteristic mode of life, and, apart from the early Kiev trading ventures, it was only in the seventeenth century that they began to move south-eastwards into the steppe lands.

The western part of this Russian homeland lies almost exactly in the same latitudes as the British Isles (*cf.* the Gulf of Finland with the Orkneys, *c.* $59\frac{1}{2}^{\circ}$ N., and Kiev, $50^{\circ} 29'$ N., with Plymouth $50\frac{1}{2}^{\circ}$ N.), but the real heartland of Muscovy, around whose nucleus the Russian state developed, lay to the north of England's heartland, Moscow being in the same latitude as Glasgow ($55^{\circ} 40'$ v. $55^{\circ} 52'$). The more continental position of the Russian lands, however, gives rise to colder winters and a shorter growing season, which conspired to produce difficult conditions for settlement, especially for early and mediæval farmers. For instance, although Moscow is 7° F. warmer in July than Glasgow, on an average, yet it is 36° F. colder in January, and the average Easter temperature at Moscow is no higher than the average Christmas temperature at Glasgow.

Soils are rather similar to those of the British Isles, and vary from podsolis to the brown forest soils. There is a greater extent of fluvio-glacial sands, which contain little plant food, and if the boulder-clays contain fewer stones than in Britain, they are particularly heavy and sticky in spring with the melting snows. The adverse effect of unfavourable climate and soils is reflected in the much lower percentage of deciduous trees in this belt than in the British Isles, the boulder-clays as well as the sandy tracts being clad with conifers. Also, there is a far larger proportion of the land covered with peat bog than in Great Britain, though not perhaps more than in Ireland.

The mixed forest zone is difficult to divide into true natural regions owing to the absence of well-marked physical features or physical contrasts, but owing to differences of historical and economic development there are certain distinctive nuclear regions.

These are:

(a) The Leningrad–Novgorod region, whose position on the Baltic led to the growth of trading interests, as exemplified by mediæval Novgorod and later St. Petersburg (Leningrad).

(b) The region round Moscow and Ivanovo, mainly between the upper Volga and its tributary the Oka, historically known as Muscovy.

(c) White or Bielo-Russia in the upper Dnieper basin, historically was a buffer area and only finally became politically part of Russia in the seventeenth and eighteenth centuries.

The Leningrad-Novgorod Region. This region comprises that part of the Russian Platform whose rivers drain to the Gulf of Finland. For convenience, Lake Peipus and the River Narva may be taken as the western limit, as these form a political as well as an ethnic frontier, but on physical grounds the whole Narva basin should be included.

The region is remarkably transitional. It lies at the junction of the northern coniferous forest (or Taiga) and the central mixed forest, and therefore at the practical northern limit of agriculture. It lies between the sea-based culture of the Baltic and the land-based culture of Muscovy. It is the meeting-place of Finns, Esths, and Karelians of Finnish speech, Scandinavians of Teutonic speech, and Russians of Slavonic speech.

Thanks to the stimulus of the Scandinavian "Rusmen" it developed precociously before Moscow was founded, and during the Middle Ages its towns of Novgorod and Pskov were trading republics, affiliated to the Hanse League, while Muscovy still dwelt in isolation. Yet because of the short, damp growing season, the ice-bound winters, and the buffer situation politically, the Novgorod region failed to maintain its earlier importance. Only Peter the Great's foundation of St. Petersburg (now Leningrad) at the beginning of the eighteenth century, following his conquest of the Neva area from the Swedes, galvanised the region into new economic activity. Even to-day the rural population is surprisingly scanty, only 44 to the square mile. Half of the entire population of the region is, or was, concentrated at Leningrad (3,191,000 in 1939).

The story of Leningrad's foundation amid the marshes of the Neva is a familiar one. The Russian city was laboriously built on piles (*cf.* Venice and Amsterdam), and it provides an excellent example of the importance of position as compared with site. The deltaic mouth of the Neva was the sole place where the Russians could wrest a foothold on the Baltic at that time, and so gain access

to a practicable sea-route to western Europe and the world at large.¹ Leningrad has relatively good inland communications by both waterways and rail. The first canal link with the Volga system was completed as early as 1710, only seven years after the laying of the foundation stone of the fortress of St. Peter and St. Paul, but the later "Marie" canal system (c. 1808) linked the Neva and Svir with the Sheksna tributary of the Volga, while the Tikhvin Canal (1811) linked up the Neva and Volga systems *via* the Mologa tributary of the Volga. The Neva waterway is also connected by a short canal with the North Dvina system.

Leningrad has long been a manufacturing city; in fact, it was the first Russian city to feel the impact of the Industrial Revolution, though its earliest functions were administrative and commercial, owing to its establishment as the capital of Russia, and to the busy traffic of its port. In spite of ceasing to be the capital of Russia at the time of the Revolution, Leningrad continued to grow, owing to its importance as a manufacturing centre. Yet Leningrad has few obvious advantages for industry. Its hinterland provided few raw materials except scanty supplies of bog-ores and flax, and no fuel except charcoal and peat—in fact, its chief source of industrial fuel was imported English coal.² To-day Leningrad draws its coal supplies from the Donetz and Vorkuta coalfields, but relies very largely for power on hydro-electricity derived from rapids on the Svir and Volkhov rivers. The chief manufactures are shipbuilding, light engineering, precision tools, textiles, cellulose (including paper and rayon), and chemicals (including fertilisers from the Kirov apatite and rubber goods), leather and alimentary industries.

Although ice-bound for two or three months every year, Leningrad is the chief port of the U.S.S.R. Its principal exports in normal times are timber from the northern coniferous forest, and wheat from the Siberian prairies.

The immediate hinterland of Leningrad is agriculturally poor, and the total land area is much restricted by the presence of Lakes Ladoga and Onega, which are respectively the largest and second largest lakes in Europe. On the southern and south-eastern sides of the city the country consists mainly of a succession of swampy depressions and lake basins on the site of former glacial "tongues"; surrounding these are low morainic ramparts, which are drier but less fertile. The climate is unfavourable to cereals, but the glacial

¹ They had formerly had to make shift with the Archangel route (*see* p. 442), for the Black Sea coast was held by the Turks until the very end of the eighteenth century.

² During the great siege of Leningrad in the recent war, many stoves were kept burning with coal-dust dredged up from the Neva, where it had accumulated from the unloading of colliers over a period of some 200 years

clays of the tongue-basins, when drained, are suitable for growing flax, hay, and fodder crops. Immediately to the west of Leningrad, along the Gulf of Finland, Silurian limestones appear on the surface, with only a thin sporadic glacial cover; and, in contrast to the rest of the area, there is a lack of surface water, but goodish soils of *rendhizina* type. It was in this area that the Tsars erected their summer palaces, e.g. Tsarskoe Selo.¹

The old urban centres of the area, Novgorod, on the Volkhov River, and Pskov (60,000) on the Velikaya, have declined to market towns, with small manufacturing industries of flax, timber, and leather, though Novgorod is said to have had 400,000 inhabitants in the fifteenth century, at the time of its greatest trading period. Modern centres are no larger, although the important bauxite deposits mined near Tikhvin are made into aluminium at Zvanka, situated close to the Volkhov rapids.

The Moscow-Ivanovo Region. This region lay on the margins of the latest (or "Würm") ice-sheet, and accordingly morainic deposits alternate with fluvio-glacial sands. There is little variety of relief, though there are occasional low morainic ridges, while the fluvio-glacial sands are still often subject to flooding and were avoided by early agricultural settlements. The early Russian settlers probably cultivated only the *polyany* (sing. *polie*), a word meaning "fields." These occurred chiefly in the southern and central parts of the zone, and probably had a light vegetation cover of deciduous woodland interspersed with meadow. These *polyany* occupied the best-drained sites on the boulder clay, or were developed on patches of limestone which were sufficiently near the surface to improve either drainage or soil, or both. The decay of the leaves from deciduous trees and of the meadow grasses naturally enriched the soil to a greater extent than the pine needles of the coniferous forest; in consequence of this and of the better drainage, the soils of these clearings are *not* podsolised, but resemble the brown forest soils of the English lowlands, and in especially favoured areas approximate to the *chernozem* of the steppes.

Elsewhere, however, podsolised soils and coniferous forest prevailed, and though large areas have been cleared, a good deal still remains in the northern part of the zone round Ivanovo. Peat bogs increase in size and frequency towards the north, and in recent years the peat has been utilised in great electric power stations to form a valuable addition to the power resources of the region.

¹ The name Tsarskoe Selo is believed to have been derived from the Finnish "Saari Mojs" or "high place," which became "Sarskoe" in Russian and subsequently "Tsarskoe Selo" or "Tsar's village"; this was later named "Detskoe Selo" or "children's village," and now (1949) is called Pushkin.

The southern margin of the mixed-forest zone, where it merges into the wooded steppe, lies roughly along the River Oka in this region, and thus the Oka would seem to be the obvious southern boundary. Yet even before the development of the Tula coalfield, which lies south of the Oka, the Tula region was associated with the Moscow area, for the Russians found a favourable habitat in the meadows and deciduous woods of the wooded steppe, and they tended to seep southwards whenever Tatar pressure weakened. Thus the Oka was usually only the second line of defence of Muscovy and not its main defensive moat.

The Moscow-Ivanovo region is the main urbanised section of the whole of the U.S.S.R., and until the 1930's was the main manufacturing area of the whole country, in spite of the development of the Donetz region in the third quarter of the nineteenth century. Industry began here because the towns offered markets, while ungrateful conditions for farming led the peasants to eke out their incomes by cottage industries, particularly textiles and blacksmith's work. Bog ores were used at first. The State also established industries, especially that of armaments, while owners of serfs employed them in various manufactures. The discovery of the Tula brown coals proved very important, although the calorific value is low, the ash content high, and the output only about 12 million tons annually. By the early years of the twentieth century the Moscow-Ivanovo-Tula region had developed flourishing factory industries specialising in pig-iron and steel, engineering, hardware, and various textiles, though the textile industry remained at least partially a hand-loom industry. Much of the necessary coal and all the coke came from the Donetz coalfield. With the development of the Ukraine and Ural industrial areas, the Moscow industrial region became *relatively* less important, but *actually* it produces more manufactured goods than before.

Moscow (4,137,000 in 1939), the capital of the U.S.S.R., was already a big city of 1,817,000 inhabitants in 1913, although it had ceased to be the capital of the Russian Empire 200 years previously. Moscow has various industries natural to a great city, such as printing, clothing, building, and alimentary industries, together with large-scale engineering industries, e.g. motor vehicles and machinery for use in the textile, agricultural, printing, and electrical industries. Its excellent central position in European Russia, together with its comparatively good communications by water and rail, put the city in an admirable position for distributing the finished goods. Although on the relatively small Moskva tributary of the Oka it is accessible to large barges and river vessels, and the construction in the 1930's of the Moscow-Volga canal puts it into

communication not only with the main river, but also, by means of the "Marie" canal system, with Leningrad and the north.

The situation of the capital city of the U.S.S.R. far to the west in relation to the whole country emphasises the great predominance of European Russia over the Asiatic portion in numbers, productivity, and political influence.

The Tula coalfield is mainly associated with iron and steel production and metal working, Tula and neighbouring centres being the Russian equivalent of the Birmingham district, and similarly, little of the iron is now obtained locally. Tula (272,000)



FIG. 146.—OLD MOSCOW—THE KREMLIN FROM THE RIVER MOSKVA.

Note the strong Byzantine influence in the architecture.

specialises in samovars, small-arms, sewing-machines, etc.; Kaluga (89,000) concentrates on agricultural machinery, including tractors; Kolomna (75,000) has an old-established locomotive and rolling-stock industry; Ryazan (95,000) makes agricultural machinery in normal times. The last three towns mentioned are all situated on the Oka River. The recently discovered phosphates which occur just north of the coalfield are worked up into fertilisers at Stalinogorsk (76,000) and elsewhere.

Another group of manufacturing towns lies along the upper Volga, and has the advantage of this great waterway. In the west lies Kalinin (216,000), situated at the head of navigation on the

Volga, where the River Tvertsa joins the main river. (*N.B.*—The old name of the town was Tver.) The town is one of the most important centres for manufacturing rolling stock, and has textile, leather, flour, and timber industries. Rybinsk (139,000), at the junction of the Sheksna and Volga, and therefore at the southern end of the "Marie" canal system, makes rivercraft, and has important saw-mills, flour-mills, and rope factories. Yaroslavl (298,000), situated where the Moscow–Vologda–Archangel railway crosses the Volga, is one of the old historic cities of Russia, but has added synthetic rubber, rubber tyres, oil-refining, and engineering to its old manufactures of textiles, leather, timber, and flour-milling. Kostromo (121,000), another ancient city, lies at the junction of the Kostromo and Volga rivers, and is an important saw-milling town, since it taps the whole of the forested Kostromo basin. It will be seen that these towns on the upper Volga make use of the timber coming down from the northern tributaries, the grain and petrol coming up the Volga, as well as local products such as flax, but they are also tending to develop engineering industries.

The textile industry is especially important in the central region and is particularly associated with the name of Ivanovo (285,000), sometimes called Ivanovo-Vosnessensk. Practically all the linen goods and one-third of the cotton goods of the U.S.S.R. are produced in this region. In this boggy and infertile area, with few alternative means of livelihood, the conditions in the cottage industry and in the early factories were notoriously bad, and Ivanovo together with Orekhovo-Zuevo (99,000) were main centres of the revolutionary movement. Various requirements of the textile industry, such as dyestuffs, starch, and some types of machinery, are manufactured in the numerous small towns of this textile belt.

Agriculture in the Moscow–Ivanovo Region. As elsewhere in the U.S.S.R., agriculture in this region is still in transition. Right down to the 1920's the old uneconomic three-field system prevailed over much of the land; rye was the chief food crop, together with potatoes in more recent years, and flax was the chief cash crop, though oats, barley, and hemp were also grown. Some market gardening was carried on. Pressure on the land had brought about a reduction in livestock, and this curtailed the supplies of meat and manure, though butter was produced for the towns in some areas. Since the 1920's the system of collective farming and the war of 1941–45 have led to a further reduction of livestock,¹

¹ This was not intended when collectivisation was started, but the peasants killed and ate their livestock, either because they feared that the animals would be confiscated or because they believed that the "government" would supply the collective farms with animals. (See *The Russian Peasant and Other Studies*, by Sir J. Maynard.)

but a greater use of artificial fertilisers and the introduction of types of wheat more suited to the climate has also occurred. Taking into consideration the latitude (*cf.* Denmark), the comparatively damp summers and the urbanisation of the area, the natural evolution seems to be in the direction of animal husbandry, particularly for dairy cattle and pigs, but the U.S.S.R.'s loss of wheat lands between 1940 and 1944 forced a continued concentration on cereals. Live-stock will become important only if the standard of living rises very considerably.

The Western Section of the Mixed Forest Zone. This region is transitional between Muscovy, which was the heart of Russia, and the Vistula basin, which was the heart of Poland, and thus is politically a buffer area. It is climatically transitional between central and eastern Europe. A Russian writer (S. P. Turin) writes of its "mild and even climate," though the average January temperature is about 17° F., and the annual range of temperature about 47° F.!

Physically the area includes: (a) the northern part of the Central Russian Uplands forming the watershed between the Volga and Dnieper systems, coinciding roughly with the province of Smolensk; (b) the cultivated lowlands along the upper Dnieper, Berezhina, and Sozh rivers, which corresponded with the White or Bielo-Russian S.S.R. before World War II; and (c) the marshy region bordering the Pripyet River, known as Polesie (Polish) or Polyessie (Russian).

As the towns are mainly route centres, the distribution of the urban population can best be considered in relation to all three sub-sections.

(a) *The Smolensk Section of the Central Russian Uplands.* The Central Russian Uplands in this region consist mainly of high, rolling plains, relieved only by low hills and broad, marshy valleys. In the north, however, are the Valdai Hills (*see* p. 427), while the most advanced terminal moraine of the latest (Würm) glaciation runs from east-north-east to west-south-west, just north of the upper Dnieper valley, whose course it has affected. It is well seen just to the north of Smolensk. South of this ridge the uplands were not glaciated, and in many areas they carry a covering of *limon* or löss, while the river valleys draining the uplands are covered with fertile alluvium derived from the *limon*. Soils are therefore mainly fertile, and agriculture gives good crops of oats, barley, flax, hemp, and potatoes. Stock rearing is fairly important, especially for pigs and beef cattle. The rural population density of 80 to the square mile is twice as high as in the Leningrad province, and is nearly twice as high as in the White Russian S.S.R.

(b) *The White Russian S.S.R.* This region became politically Russian at the first and second partitions of Poland in 1772 and 1793. It

lies mainly in a "tongue-basin" of the maximum (Riss) glaciation, though its northern extremity, north of Orsha and Minsk, comes within the terminal moraines of the latest (Würm) glaciation. South of these moraines there are considerable areas covered with outwash sands. The soils of both the glacial clays and the sands tend to be podsolised. There are also large areas of swamp and bog, which increase in area and frequency towards the south, and begin to be a dominating feature of the landscape along the lower Beresina, along the Dnieper near its confluence with the Pripet, and more especially along the latter river. The poor drainage of this area is partly due to its receiving a great deal of water from the surrounding higher land, but it has been aggravated by the epeirogenic rise in post-glacial times of the crystalline floor of the Russian Platform in the Dnieper Heights south of Kiev. Owing to the hardness of these crystalline rocks, the Dnieper has not been able to keep pace with this elevation, and in consequence of the "bottle-neck" below Dnepropetrovsk, the waters of the upper Dnieper and its tributaries have been ponded back. The name of the town Bobruisk (from Slavonic *bober*=beaver) indicates the watery habitat in which beavers used to flourish. The marshes are not generally of the sphagnum or northerly type found round Leningrad and Ivanovo, but of the sedgy type, and when drained they provide fertile soils, though on the whole the soils of White Russia tend to be sandy and infertile, and a good deal of forest still remains on the morainic hills of the north, and on the least amenable of the soils farther south. The livestock (particularly pigs and cattle) of this region have long been well known throughout Russia, with the by-products of hides, pig-skins, and bristles. Oats and barley, largely grown for fodder, supplement the water-meadows and rotation grasses. Potatoes, hemp, and flax are important here as elsewhere in the west of European Russia.

(c) *The Pripet Marshes of the Russo-Polish Borderland.* Most geologists now believe that the marshes of Polyessie (or the Pripet Marshes) occupy the site of a great glacial *urstromtal* or *pradolina*, and it is not now generally held that they occupy the site of an ancient lake. Both the pre-Quaternary and post-Quaternary events had considerable influence on the evolution of the area; to north and south it is bounded by anticlines whose axes run east-west, while west of Brest-Litovsk (Polish, Brześć-na-Bug) it is bounded by another anticline with axis running north-south. The edge of the ice-sheet, during the most recent glaciation, lay for a long time in a great curve concave to the south-east along the western and northern anticlinal margins, and an enormous quantity of melt-water was available, which could not escape directly southward,

owing to the presence of the southern anticline. An exceptionally large *pradolina* was formed, whose waters could escape only by the eastern or unenclosed side, until they found an easy way southward down the old "tongue-basin" of the Dnieper valley.

After the ice-sheet had disappeared the *pradolina* was not completely drained by the Pripet, owing to the check imposed on the escape of the water by the epeirogenic uplift of the Dnieper Heights, as mentioned above.

A further consequence of this reduction of gradient is still in progress, and may eventually result in the natural drainage of the marshes. It is evident that the waters of the upper Pripet lie nearer the Baltic than the Black Sea, and as a result the headwaters are in process of capture by the Polish river Bug.

The marshes of Polyessie form one of the poorest regions of Europe. The area resembles the English Fens before their drainage, though the scale of the Polyessie marshes is much larger. Innumerable streams thread the area in all directions, and permanent "broads" and marshes abound. During low water, which occurs in late summer and again in winter, there is a fair amount of more or less dry land, but with the spring thaw the waters rise and wide areas are inundated. In some places sand-dunes occur which are survivals of a drier climatic period, but the main exception to the watery picture is the peninsula of *terra firma* at whose eastern end stands Pinsk (c. 23,000). Trees, such as birch and alder, grow thinly in the marshes; pine trees occur on the drier sandy stretches, and timber plays a great part in the life of the people; houses and boats being made of wood, and timber being the chief fuel. Agriculture is, of course, not very important, but rye, potatoes, and flax are cultivated in the areas above flood-level, hay is cut from water-meadows, and marsh grass from land which remains swampy throughout the year. Fishing and fowling, together with the rearing of ducks and geese provide additional food, though some pigs and poultry are reared.

Communications are naturally difficult, except in winter when both water and ground are frozen, and in summer by boat, and although a single-track railway was built from Gomel *via* Mosir to Pinsk, the trains cannot attain much speed. Many areas are accessible only by punts. The economy is necessarily backward owing to the lack of communications, and the need for large-scale drainage works for which plans exist. The population density was 80 per square mile in the Polish section (Census 1931), and 62 per square mile in the Russian section (Census 1939). The region now forms part of the Bielo-Russian S.S.R.

Towns and Industries of Bielo-Russia. Most of the towns in the western section of the mixed forest zone are of mediæval origin. They are usually route centres and are mainly situated at river crossings. The old north-south route from Novgorod to Kiev crosses the east-west route leading from central Europe to Moscow in the neighbourhood of Orsha. The former route linked regions of contrasting natural resources, the latter linked regions in contrasting stages of economic and cultural development. On the east-west route, now followed by the Warsaw-Moscow railway, lie Smolensk, Orsha, Borisov, and Minsk. This was the line of Napoleon's advance on Moscow, a route which goes between the Polesian marshes on the south and the morainic hills on the north. In modern times many of the towns have greatly developed industrially, but not to the same extent as towns situated farther from the western frontier. The lack of coal and other minerals handicaps great industrial development, though peat is used to a considerable extent in electric power stations, while phosphates and some iron-ore are mined in the Central Uplands.

Minsk (239,000), at the crossing-point of the Moscow-Warsaw and Liepaja-Kharkov railways, owes its size mainly to its administrative functions as capital of the White Russian S.S.R. Smolensk (157,000), an old city on the upper Dnieper, mentioned as early as the ninth century, was a trading intermediary between Novgorod and Kiev. After being disputed for many centuries between Russians, Lithuanians, and Poles, it finally became Russian in 1686, and henceforward played an important rôle in the intellectual, religious and economic life of Russia. Situated where the Warsaw-Moscow railway is crossed by the Orel-Riga line, it became an important commercial centre, and like Minsk, developed various industries connected with the products of the countryside, such as distilling, brewing, the working of timber and flax, but heavy industry is lacking.

Vitebsk (167,000), in the north of the White Russian S.S.R., is situated where the Leningrad-Orsha railway crosses the Moscow-Riga line, and is noted for linen and knitwear industries; Gomel (144,000), in the the south, is situated on the Sozh tributary of the Dnieper at a point where it is now crossed by several converging railway lines; it has a flourishing timber industry and manufactures agricultural machinery. The timber industry is also important at Bobruisk (84,000), where cellulose and paper are manufactured on a considerable scale. Bryansk (88,000), in the province of Smolensk, on the Desna tributary of the Dnieper, is an important railway junction and the only town of the western region which developed considerable metallurgical industries, specialising in

locomotives and rolling stock. It lies on the margin of the forest and the wooded-steppe and originally obtained its iron-ore from Sukhinichi in the Central Uplands.

The towns of White Russia and the adjacent areas all possess a large Jewish element, amounting to some 40 per cent. of the total urban population.

It is worth noting that the percentage of urban population of the "passage-land" of White Russia is higher than in the more agriculturally prosperous Smolensk region.

As regards language, about half the population of the Smolensk region is classified as speaking "White Russian," and rather less than half as speaking "Great Russian."

THE BALTIC STATES: ESTONIA, LATVIA, LITHUANIA

The three east Baltic states or republics in the aggregate have an area as large as that of England, Wales, and Northern Ireland together. Even Estonia, the smallest, is half as large again as either Belgium or Holland, and somewhat larger than Denmark. Nevertheless, they are little known to most English people despite their maritime position. It is true that their total population is not very large (about six million), only about that of either Sweden or Portugal, but Lithuania has almost as many people as Norway, of which few English people do not know something. The main factor in our ignorance of these countries lies very largely in their past history. This area of the eastern Baltic states lay generally outside the sphere of British interests, and their position linked the Ests, Letts, and Lithuanians with Russian, Polish, and Swedish history.¹ Yet between the two world wars their closest economic ties were with the United Kingdom, which figured as the leading importer of their produce, and as first or second in the list of suppliers of manufactured goods. Even this slender link will probably be weakened with their incorporation as constituent republics into the U.S.S.R., for their external trade will probably be re-orientated.

Position in Relation to Russia. The three Baltic republics stand in somewhat the same relation to Russia as the Netherlands (Holland) do to Germany. From the point of view of the larger neighbour they are essentially *transit* lands. The best means of access from the U.S.S.R. to the North Atlantic lie through the Estonian port of Tallinn and the Latvian ports of Riga, Ventspils (Windau), and Liepaja (Libau), while the much disputed port of Memel (Klaipeda)

¹ Chaucer had evidently heard of Latvia, for he says of his Knight, in the Prologue to the *Canterbury Tales*: "In Lettowe had he resed (journeyed) and in Russe, No Christened man so oft of his degree."

has also some importance as an outlet for the White Russian S.S.R. *via* Minsk. These ports have the great merit of being much less hampered by ice than those near the head of the Gulf of Finland; in fact, the ports which stand on the bulges of the coast, such as Liepaja, are normally open to shipping throughout the winter without the use of ice-breakers, while the average duration of the winter freeze at Baltiski and Tallinn is only four weeks and seven weeks respectively, compared with four or five *months* at Leningrad. Before World War I, when the Baltic states were under Russian rule, Liepaja was a great exporter of produce both from the Ukraine and Siberia. It was also an important naval base.

The strategic significance attached to this east Baltic area by Russia was attested by the very powerful fortresses, *e.g.* of Daugavpils and Kaunas, and by the great military roads, which took no account of local needs, but which went straight across country.

The People. In spite of forming part of the Russian Empire from the eighteenth century onwards until 1918, the people of the Baltic states are much less Russian than the Dutch are German. Their ethnic individuality was proclaimed in the establishment of their independence in 1918, and has been acknowledged in their status of autonomous republics since their re-inclusion within the Soviet realm after the war of 1941-45.

The Estonians speak a language which is akin to the Finnish, while the Latvians and Lithuanians speak non-Slavonic Indo-European languages, which are peculiar in showing many archaic characteristics.

Before 1918, however, only the Lithuanians had ever possessed an independent organised state. There is, indeed, a very striking contrast between the success of the Dutch in maintaining their independence against powerful neighbours and the lack of such success on the part of the east Baltic people. The reasons are varied and complex, and are by no means entirely geographical, but it may be pointed out that these Baltic states lay far removed from the civilisation of the Roman world, whereas the Dutch (Batavians) got an early start owing to their more favourable *position*, which their peculiar genius turned to good account.

The east Baltic people remained heathen, and therefore cut off from the learning and organisation of the Mediterranean and Western world, at least until the fourteenth century. The Lithuanians, who had a nucleus on the lower Niemen, were the most southerly of the three peoples and therefore enjoyed better climatic conditions for agriculture, actually founded an empire of considerable size (*see* p. 297) at the expense of their eastern neighbours, the Tatars and Russians. Through its union with the Polish

crown, however, Lithuania lost its individuality and its ruling class became Polonised. The country as a whole stagnated. The undeveloped state of the country itself and of its Russian hinterland prevented the development of an important transit trade, while such sea-borne trade as existed in the Middle Ages and early modern times was in the hands of the German-controlled Hanseatic League. For the Lithuanians, like their Slavonic-speaking neighbour, appear to have been purely landmen. At the third partition of Poland, 1795, Lithuania fell to Russia.

Estonia and Latvia were conquered by a crusading order, the "Teutonic Knights" during the thirteenth century, and both countries were Germanised to the extent that the land belonged to this German religious order, and after the order was secularised in the sixteenth century the land passed to the German "Baltic Barons." Trade was conducted by German merchants, Riga and Tallinn being Hansa towns. In the seventeenth century, Estonia and northern Latvia passed under Swedish control, while southern Latvia was transferred to Poland. In the eighteenth century (in 1721 and 1795) both areas fell to Russia.

National feeling developed much later in this part of the world than in western Europe. It was mainly in defence of their language that each of the three peoples developed their political nationalism, in the face of a strong attempt at Russification during the second half of the nineteenth century. The Lithuanians alone had a tradition of former independence and of imperial glory to uphold their nationalist ideal. The ostensibly tolerant policy of the U.S.S.R. towards national minorities appears to be combined with considerable deportations of the native inhabitants and the settlement of Russians in the former republics.

Physical Background. The most northerly point of Estonia is about lat. 59° N., and the most southerly part of Lithuania about 54° N.; that is to say, the region lies in the latitudes of Denmark and southern Sweden and of Scotland, and thus on the borders of the deciduous and coniferous forests, in the zone of rye, oats, potatoes, and flax. Owing to the position on the Baltic, with a large stretch of water to the west, the climate is rather damp and suited to grass and fodder crops.

Very little of the land is over 600 feet high, so none is too high for cultivation, but as the region was all glaciated, the superficial deposits give rise to soils of very varied fertility. The disturbance of the drainage system which was bound up with the glaciation has been responsible for many waterfalls and rapids, some of which have been used for hydro-electricity. None of the republics is rich in minerals, though the oil shales of Estonia are of considerable value.

Surface Features Resulting from the Quaternary Glaciation. This area presents a classic example of morainic deposition on the edge of a great ice-sheet. Only in north-western Estonia is the drift so thin that the solid rock appears at or near the surface and here the great ice-sheet scraped off most of the soil, but the low plateau of Cambro-Silurian limestone which resulted (zone A in Fig. 147) is streaked with eskers.

At first sight the arrangement of the morainic land-forms seems quite haphazard, for outwash plains, terminal moraines, *urstromtäler*, drumlins, and other ground-moraine landscapes succeed each other rapidly and without any clearly marked order or sequence. The clue to this puzzling situation may be found in Fig. 147. At its greatest extent, and in its most active form, the last great ice-sheet threw up a great girdle of end-moraine (marked in the figure as zone C) with characteristic "knob and basin" topography. This, broadly speaking, forms the "rim" between the Baltic drainage and the Black Sea drainage, and forms a belt running from north-east to south-west some 70 or 80 miles wide. Daugavpils and Kaunas lie on the Baltic

side of this belt and Minsk lies just to the south of its south-eastern edge. The "knob and basin" topography generally presents a wildly haphazard arrangement of little hills and lake-filled basins, but in the Vilna region there is a well-marked "tongue-basin," girdled by morainic ridges.

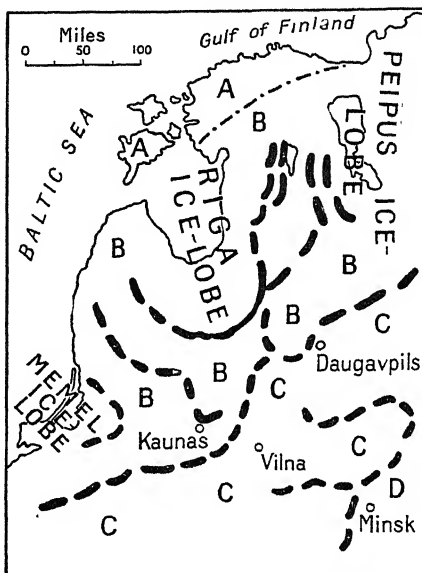


FIG. 147.—SOME GLACIAL FEATURES OF THE EAST BALTIC REPUBLICS AND ADJACENT AREAS

A=Esger, or "Harju" region, with solid rocks at or near surface.

B=Ice-lobe region. A late stage of the ice-lobes is depicted. Festoons of end-moraines (shown in black) outline the tongue-basins.

C=Main Baltic end-moraine, with "knob and basin" topography, except for the Vilna tongue-basin.

D=The main outwash plain. (In White Russia.)

At a later stage, when the ice-front had retreated somewhat, the ice-sheet was evidently thinner and its edge became frayed into a series of great ice-lobes which occupied the hollows (tongue-basins), now partially filled by Lake Peipus (or Pskov), the Gulf of Riga, and probably the Memel Gulf also. These long vanished ice-lobes gave rise to the main-topographical features of zone B (Fig. 147). End-moraines were thrown out in great festoons round the ice-lobes in the tongue-basins, and accordingly the direction of the moraines bears no relation to the *generalised* edge of the ice-sheet, but is closely connected with the shape of the ice-lobes. As it appears that the ice-lobes retreated spasmodically, each stage or pause was associated with the formation of a new morainic girdle. From these moraines the melt-water escaped on the outer sides across outwash plains, or along narrow fluvio-glacial valleys where sands were deposited on the floor of both outwash plains and *urstromtäler*. Occasionally the water was ponded back in ice-dammed lakes, of which the Virtsjärv (Estonia) is a surviving remnant, and better soils resulted. As the lobes of ice melted, a ground-moraine landscape, sometimes rich in drumlins, emerged from beneath, as in central Estonia, west of Tartu. Sometimes, however, this fertile drift was concealed beneath later terminal moraines or outwash plains.

The picture is further slightly complicated by the fact that the edge of the ice-sheet receded towards the north or north-east in its later stages, instead of towards the north-west as in its intermediate and earlier stages. Thus, there tends to be, especially in Lithuania, two sets of morainic ridges, running almost at right angles to each other, and this has resulted in a very confused topography which hinders the development of an adequate drainage system. This, in turn, means that large areas of land are liable to flood, particularly in spring after the thaw has set in, and to a certain extent in autumn. This flooding has an adverse effect both on farming and communications, while even the forests which grow on these areas consist of poor quality wood.

After the withdrawal of the ice, various oscillations of level affected the region. The waters of the Yoldia Sea, the Ancylus Lake, and the Littorina Sea rose over the coastlands, sometimes depositing fertile clays, at other times giving rise to sands and subsequently to peat beds. Later the lowering of the water-level led to a slight rejuvenation of the river system, and in consequence the rivers have somewhat incised their beds, and in places have cut down to the solid rock beneath the glacial deposits, as at the falls on the River Narva, which are utilised for the cotton textile industry at the town of the same name.

Estonia. Estonia, with an area of 18,353 square miles is the smallest of the Baltic republics, but is rather larger than Denmark. Being the farthest north, it has the least favourable climate and suffers from the shortness of its growing season. The density of population is lower than in Latvia or Lithuania (61 per square mile), but the country was reckoned to be the most progressive of the three republics, and between the two world wars the energy of the inhabitants was able to effect a considerable improvement in the standard of living. The distribution of the large estates of the German "Baltic Barons" among the peasants in 1918 was accompanied by the development of a co-operative dairying industry on the Danish model. Of the land, 41 per cent. is under meadow or rough pasture, 23 per cent. is arable, 20 per cent. forested, and 16 per cent. waste. The rural population is dispersed in tiny hamlets and isolated farms.

Northern Estonia (the Esker Belt). Estonia consists of three physical regions. In the north, rising from the Gulf of Finland by means of a steep cliff (the "Glint"), is a low plateau which attains a maximum height of about 550 feet. Its Cambro-Silurian limestones are crossed by eskers ("Larju"), trending mainly from north-west to south-east, and the area is not very fertile. A belt of oil-shales runs parallel to the Gulf of Finland, about six to ten miles inland, and the shales are processed to give gas, tar, mineral-oil, etc.

The practically ice-free port of Tallinn is of great value to the country. Tallinn (147,000 in 1938), the capital of Estonia, is an old town of picturesque appearance, standing on a deep bay at the entrance of the Gulf of Finland.

Central Estonia (the Drumlin Belt). A broad depression runs from Pärnu on the Baltic via Tartu to Lake Peipus. Though sand and peat-bog cover much of the area round Pärnu, most of the region is characterised by the presence of drumlins, running from north-west to south-east, with fluvio-glacial valleys (*urstromtåler*) threading their way through the countryside. The boulder clay of the drumlins gives rise to fertile soil, and the region is highly cultivated, except in the west where forested sands are found. Tartu (60,000), on the Ema River, is the second largest town of Estonia; it owes its fame chiefly to its university, founded by the Swedes in 1632.

South-east Estonia (the Morainic Belt). This region attains only moderate elevations (e.g. Great Munamägi in the East Livonian Heights=1,054 feet), but is distinguished by extreme surface irregularity, since morainic material from both the Peipus and Riga ice-lobes was piled up here. Cultivation mingles with woodland; flax is widely grown.

Latvia. Latvia has the advantage over the other two republics of having no less than three good ports, each possessing good rail

connections with the interior. By virtue of its navigable river the Daugava (known as the Western Dvina in its Russian section), Riga became the most important port of the whole of the east Baltic at an early date, and with nearly 400,000 inhabitants at the 1935 Census it is the largest town in any of the republics. Liepaja (57,000) and Ventspils (16,000) are much smaller. Latvia is the chief timber exporter among the three countries concerned, mainly on account of the timber floated down the Daugava from White Russia, though some is locally produced, about 27 per cent. of Latvia's surface being forested. Before World War I Riga claimed to be the largest timber exporting port in the world. It also exports considerable quantities of butter and flax.

The main artery of Latvia is the Daugava River, which links the various physical regions together. In the extreme south-east of Latvia the Daugava drains (a) the "knob and basin" country of the main Baltic end-moraine; then by means of its Aiviekste tributary it drains (b) the southern edge of the Peipus tongue basin round Lake Luban. It then incises its bed in hard, red Devonian sandstone, with (c) the morainic South and East Livonian Heights on the north-east, and runs into (d) the Riga depression. With the latter may be included the Jelgava plain. The only remaining physical region is (e) the Courland plateau.

(a) *The "Knob and Basin" Country* is strewn with small lakes, and is more suited to woodland than cultivation, though much of it is cropped. The area has the old regional name of Latgale.

(b) *The Valley of the Aiviekste* is the only large part of Latvia which is quite unsuitable for farming, owing to the presence of very infertile sands. The whole region is forest-clad except for the swampy areas. The sands may presumably be considered to be the outwash derived from the morainic heights on the north-west which covered up the clays of the tongue-basin.

(c) *The Livonian Heights*, which are dotted with small lakes, are partially wooded. Their maximum height is 1,017 feet.

(d) *The Riga-Jelgava Plain* is a horseshoe-shaped depression encircled on the landward side by the most recent end-moraines of the Riga ice-lobe. After the ice-tongue had withdrawn somewhat to the north, this area was covered with the waters of an ice-dammed lake, which deposited clays and sands in somewhat haphazard fashion. It is mainly fertile and well-cultivated, except along the coasts, where sand-dunes are accompanied by dreary bogs.

(e) *The Courland Plateau* carries a good deal of boulder-clay, and is mainly highly cultivated and thickly populated, though the coastal region has poor sandy soils, covered with forest and bog.

Lithuania. Lithuania lies mainly in the basin of the lower Niemen, though its northern border is drained by the upper courses of rivers whose mouths are in Latvia. It cannot be said, however, that the Niemen and its tributaries adequately drain the country, whose low-lying stretches become notoriously flooded especially during the spring thaw.

On broad lines the country may be divided into two main sections, a small area known as "High" Lithuania in the east, and a larger area known as "Low" Lithuania in the centre and west. "High" Lithuania, developed on the main Baltic end-moraine, is mainly over 500 feet in height. The Niemen in this zone has cut down to the solid rock between Grodno and Kaunas, and foams over at least fifty rocky sills and rapids. "Low" Lithuania, though mainly low-lying, is crossed by festoons of end-moraines (*see* Fig. 147). Of these, the most noteworthy form the heights of Telsiai and Šiauliai, and run in a generalised north-west to south-east direction, with heights of over 500 feet. These heights appear to have been formed chiefly by the Riga ice-lobe, but also represent the outer rim of the Memel tongue-basin. Another fairly well-marked ridge runs from north-west to south-east, just north-east of a line joining Memel and Tilsit. This represents part of the inner end-moraine of the Memel tongue-basin. In northern Lithuania part of the rim of the Riga tongue-basin is found south of Jelgava.

Boulder clay predominates in the lowland region, except on the morainic ridges, where sandy and pebbly beds are common, especially in the Siauliai Heights; also west of Kaunas there are wide expanses of sand which seem to represent an outwash plain from the Siauliai end-moraine.

The population density of Lithuania is higher (127 per square mile in 1940) than in either Estonia or Latvia, but the country is generally considered more backward. Agriculture remains principally of the subsistence type and methods of farming are primitive, while industry is little developed. The country, however, exported large quantities of eggs (72 million in 1938), and more flax than either Latvia or Estonia. Its timber exports were largely derived from the Polish (Grodno) hinterland, only 17 per cent. of Lithuania's surface being under forest.

Kaunas (Kovno; 113,000 in 1940) on the Niemen is the capital of the republic, although the Lithuanians claimed Vilna as their chief city (*see* p. 464). Kleipede or Memel (36,000) is the only port. With its surrounding territory, it was awarded to Lithuania by the League of Nations in 1923, but retained a large measure of local autonomy, in view of its mainly German population. It reverted

to Germany on the Germano-Russian Treaty of 1940, but came within the Lithuanian S.S.R. in 1945, and was renamed Klaipėda. Owing to the Germano-Russian frontier having been situated just east of Memel prior to 1917, there was no railway link across the frontier and the Lithuanians constructed the railway linking the port with the Kaunas-Liepāja line near Šiauliai.

The Vilna Area. This interesting and much-debated little area occupies a tongue-basin within the main Baltic end-moraine. The rim of this old ice-lobe is indicated in Fig. 147, and forms a rampart of less fertile heights surrounding a low-lying plain of fertile soil. The farming inhabitants of this district are of Lithuanian speech, but the majority of the townspeople of Vilna were Polish. At the time of the establishment of Lithuania as a separate state in 1918, Vilna was a large and important town of some 215,000 inhabitants as against some 90,000 in Kaunas; the independence of Lithuania was proclaimed here (in 1917), for Vilna had been the chief town of the ancient Grand Duchy of Lithuania. Its size and importance resulted largely from its nodal position, which was emphasised by the railway lines which crossed here (Leningrad-Berlin, and Minsk-Liepāja). The town and the surrounding area were seized by Poland in 1920 and remained Polish until the Russian occupation of eastern Poland in 1939, when the whole Vilna region was handed over by Russia to Lithuania, only to be removed once more and incorporated within the White Russian S.S.R.

REFERENCES

- Die Baltischen Lander*, by Dr. M. Haltenberger (Leipzig and Vienna, 1929)
Litauen, by Dr H. Mortensen (Hamburg, 1926). *Reine Geographie. Eine Methodologische Studie beleuchtet mit Beispielen aus Finnland und Estland*, by J. G. Granö (Helsinki, 1929). A good account of the evolution of the Pripyet Marshes is given in *Etude sur la morphologie glaciaire de la Podlachie et des Régions limitrophes*, by Bogdan Zaborski, in *Révue Polonaise de Géog.*, Tome VII, Warsaw, 1927.

THE BLACK EARTH REGION

SOUTH-EAST of the zone of mixed-forest the country belongs mainly to the Black Earth or *chernozem* zone which corresponds broadly to the prairie or tillable grassland region. This zone stretches as far south as the Black Sea near Odessa, and encircles the Sea of Azov. On the west it dies away at the foot of the forested Carpathians. On the east, its limits are the Ergeni Hills and the Volga between Stalingrad and Saratov. It continues eastward across the Volga between the latitudes of Saratov and Kazan, but the belt is here much narrower, being replaced east of the lower Volga by semi-desert. The Black Earth belt attains its maximum width from north to south of some 700 miles between the Oka River and the foot-hills of the Caucasus, but it is only about 300 miles wide east of the Volga.

Along the northern edge of this zone there is a transitional region, averaging about 100 miles from north to south, where the soil, strictly speaking, belongs to the type known as "degraded *chernozem*." This strip, which is known as wooded-steppe or parkland (*see* p. 435), extends southwards about as far as Voronezh on the Don and Saratov on the Volga. From the practical point of view there is not much difference between true *chernozem* and degraded *chernozem*, since both are deep, fertile soils, becoming sticky when damp and dusty when dry, and both are very suited to the growth of cereals. There is, however, one very important difference between the wooded-steppe zone and the prairie zone. Although the trees in the wooded-steppe have mostly been cut down, yet both trees and bushes can be grown here with little difficulty, so that *potentially* this belt is suited to mixed farming, with orchard trees (apples, pears, cherries) as an important element. In actual practice, little advantage has been taken of this aptitude, except in the Ukraine.

Russian Settlement of the Black Earth Region. The Black Earth region is the scene of relatively recent colonisation, for early Russian attempts to settle here were frustrated by such warlike nomads as the Petchenegs (tenth century A.D.) and the Cumanians or Polovitsi (eleventh to thirteenth centuries). In the fourteenth century the Tatars of the Golden Horde drove the Russians northwards and

north-westwards, even from the wooded-steppe, while as late as the sixteenth century the Tatars of the Crimea habitually raided as far north as the edge of the central mixed-forest belt and thus checked any expansionist tendency. It was only towards the end of the sixteenth century that a Russian counter-advance began. This took place from two directions: (a) from Muscovy, and (b) from the Lithuanian-Polish lands between Kiev and Lwow. The latter colonisation was associated with the word *Ukraine*, meaning a frontier or marchland, and the term was particularly applied during the seventeenth century to the wooded-steppes or parklands on both sides of the Dnieper; later it was extended as the settlers moved eastwards and southwards. It is noteworthy that steady, agricultural advance down the Dnieper did not reach the southern limit of the wooded-steppe until the beginning of the seventeenth century, though Cossacks (Kazaks) or military pioneers lived in fortified camps below the Dnieper rapids (*cf.* Zaporozhe = "beyond the rapids"). From the Moscow area the advance of the tillers of the soil was also slow, but by about the middle of the seventeenth century a continuous, fortified barrier ran along the southern side of the wooded-steppe, from Byelgorod on the Donetz to Voronezh on the Don, and thence north-eastwards to Kazan and even beyond. Behind this fortified line the agriculturalists had some measure of security. In advance of this fortified line were communities of "Great" Russian Cossacks (as distinct from the "Little" Russian Cossacks of the Ukraine), who lived in fortified villages, particularly along the lower Don and the middle Volga, and engaged in fishing and piracy.

The advance into the true grasslands or prairies did not come until the second half of the eighteenth and the early part of the nineteenth centuries, and until the very end of the eighteenth century the Tatars under their then suzerain, the Ottoman Empire, held the northern shores of the Black Sea, including the land round the Sea of Azov. The prairie was not a friendly environment for people from the mixed-forest zone or even for those from the wooded-steppe, if only because timber played such a large part in the everyday life of the forested Russian "homelands." On the treeless prairie the people had to find substitutes for timber as a material for house construction, the wooden walls and roof of the forest lands being replaced by adobe walls and thatched roof. No satisfactory substitute was found to replace wood as fuel, and up to modern times the villagers burned straw and dried dung, which gave little warmth to counteract the low winter temperatures. Village settlements clung to the valleys where timber and brushwood were available, and where water could be obtained by sinking wells,

even if, as often happened, the stream ran dry in summer. Many of the streams are dammed back to provide ponds for watering livestock, and in earlier days provided heads of water for driving flour-mills. In contrast to the forested lands, settlement is here highly nucleated and there are no isolated farms.

Some Harmful Results of Unsuitable Agricultural Methods.

Practically the whole of the prairie region has now been under cultivation for at least a hundred years, while most of the wooded-steppe has been under cultivation for some 200 to 250 years. Both regions are justly famed for their fertility, but several bad effects have resulted from injudicious agricultural methods. The destruction of the trees of the parklands has been carried very far. Writing in the 1840's, the Russian writer Turgenev said: "In the eastern part of Orel the village generally lies among cleared fields, near a ravine which has been somehow turned into a dirty pond. Except a few bushes, which serve every purpose, and two or three gaunt birches, you won't see a tree for a mile round." Yet the parkland near Voronezh, even farther south, had supplied all the timber for Peter the Great's fleet in his attack on Azov about a 150 years earlier.

The word "ravine" in the above quotation suggests another very serious effect associated with the advent of the plough. The removal of timber in the wooded-steppe, and of the natural protective carpet of grass and its associated herbaceous vegetation in the prairies, has exposed the Black Earth to erosion both by rain and wind. As the rain, though small in amount, comes mainly in torrential thunderstorms, it has a very powerful erosive action. Moreover, as the underlying subsoil is löss, which is very friable and easily eroded, once gulleys begin to form they deepen very rapidly. The low-lying flood-plains and "young" plains, which were under the Pontic Sea in recent geological times, are, indeed, not much affected by gulying, but the greater part of the wooded-steppe and prairie zones consists of low plateaux in which the river system is incised, and accordingly conditions are naturally conducive to the development of ravines. The cause and results of gulying are the same here as in the Middle West of U.S.A. and are similarly due to applying methods of agriculture which are suited to the damper, forested homelands of the pioneers to an unfamiliar environment, with the result that a great amount of soil has been lost, and many formerly gently sloping surfaces have become deeply cut up and rendered useless. The régime of the rivers has also changed for the worse, with the alternate floods and droughts both being accentuated. Some steps have already been taken in Russia to counteract the menace of gulying and, no doubt, contour-ploughing and other methods employed in America could be employed here

with good effect. It is more difficult to counter the loss of soil due to wind erosion, for the extremely fine, powdery Black Earth is easily carried away by wind. A decrease in the amount of ploughland, and an increase in the area under cultivated grass, would no doubt prove as beneficial here as in U.S.A.

The Central Black Earth Region. This region, comprising the former provinces of Orel,¹ Kursk, Voronezh, Tambov, and the southern part of the Tula and Ryazan provinces, presents two main types of relief.

On the west is the plateau of the Central Russian Uplands, with Orel and Kursk as the chief centres, while on the east is the Don-



Photo · B. Keller]

[From the Journal of Ecology by permission of the Editor

FIG.148.—MEADOW STEPPE (MOWING MEADOW) WITH ALDER THICKET IN THE DISTANCE. GOV. VORONEZH

Tsna plain, centred on Tambov. The former, varying in height from about 600 to 900 feet, is a dry area in which water is obtainable only at depth. It appears hilly near the relatively few rivers, but otherwise is an undulating plateau deeply cut up by ravines which are avoided by railways and roads alike. The Don-Tsna, or Tambov, plain is flat or gently undulating and is traversed by many small rivers, and water is easily obtainable. During the spring thaw the plain is notoriously muddy; for instance, the name of the town Griasi literally means "the muds."

The River Don forms a convenient line of division between the two relief regions, for it hugs the plateau closely, having undercut

¹ Pronounced Oriol or Oryol

the edge to form an escarpment which overlooks the plain. In this escarpment the underlying rocks of the plateau are revealed; Carboniferous and Devonian limestones in the north, and chalk farther south. The Don itself is not one of the most navigable of Russia's rivers, in spite of its length of 1,240 miles and its low gradient, its source being only 590 feet above sea-level. Unlike the Dnieper and the Volga, the Don has its course entirely in the wooded-steppe and prairie regions, and there is no marshy or forested land in its basin to maintain the flow of water during the summer; moreover the snow-cover is thinner here than in the forest belt and lasts a shorter time, while evaporation in summer is high. Consequently the river suffers from very low water in late summer and early autumn, though it may be a broad, tumultuous, swirling torrent during the spring thaw.

Agriculture. As the whole of this region lies within the wooded-steppe vegetation zone and has similar soils throughout, the type of produce grown is also much the same over the whole area; cereals are naturally important; winter wheat, barley, rye, oats, and millet are all grown; hemp, and to a less extent flax, are traditional crops, valued for their oil as well as for their fibre. Sunflowers form an important source of fats for human consumption, besides being used as poultry food; children and even grown-ups chew the seeds like sweets. Tobacco is widely cultivated throughout the region, while the Kursk-Voronezh area is second only to the western Ukraine for the production of sugar-beet. Most of the region was already noted in the nineteenth century for good breeds of cattle and horses, and there was a good deal of bee-keeping, both honey and wax entering into commerce. Sheep were reared towards the drier south, but were decreasing in numbers even before the Revolution of 1917. There was a certain amount of non-commercial fruit-growing.

As far as can be ascertained, there was a tendency just before World War II towards an increase in the area under permanent grass and root-crops in the effort to increase the numbers of live-stock. There was also a tendency towards specialisation in industrial crops. Pigs and poultry seemed to be on the increase. It must be remembered, however, that the old three-field system prevailed down to 1929, and the dislocation consequent upon collectivisation continued well into the 1930's, while after 1941 the war interfered with normal development. Collectivisation seems likely to bring about greater specialisation than prevailed under the system of peasant farming, where each family aimed at self-sufficiency, and greater specialisation is likely to emphasise minor differences of soil, water supply, and position with regard to markets.

Industry. The Central Black Earth region is little industrialised, but industries depending on agriculture such as flour-milling, tanneries, oil-pressing, hemp-carding, rope-making were established in the chief towns at the end of the nineteenth century and at the beginning of the present century. Within recent years, factory industry has greatly increased, particularly the boot and shoe industry (especially at Voronezh and Tambov), sugar-refining, distilleries, butter-making, starch production. The peasant industries, which included pottery, weaving, the production of boots and felt goods, have largely died out since 1917.

The Kursk iron-ores constitute a great reserve for the future, but as the metallic content is low and the deposits occur at great depth, they have not been of any great consequence in the past, though new mines are being sunk under the 1946-50 Plan. The iron-ores near Lipetsk are smelted at that rapidly growing centre (67,000 in 1939; 21,000 in 1926), but otherwise heavy industry is largely lacking in the Central Black Earth region. Machinery of various kinds was being manufactured at the larger centres, *e.g.* aeroplanes and machine tools at Voronezh, agricultural machinery at Kursk, Orel, and Michurinsk. The latter town, formerly known as Kozlov, is an important railway junction and manufactures rolling-stock.

Towns. Voronezh (327,000 in 1939) is the largest town of the region and has been important since the end of the seventeenth century. It trebled its population between 1926 and 1939 owing to its development as an industrial, administrative, and cultural centre. It lies just to the east of the River Don, where the latter is joined by the Voronezh River which drains the western part of the Tambov plain. In modern times, however, the position of the city on the main railway from Moscow to Rostov is of more importance than its water communications, which, though much used in the past, are of poor quality.

Tambov (121,000), founded in 1636, is the second largest town and stands on the Tsna River which drains the eastern part of the plain. It is a very important grain-collecting centre, though it reveals its proximity to the central forest belt through being largely built of wood.

Kursk, though slightly smaller (120,000), is a much older foundation, and actually dates back to the eleventh century, when it was an important stage on the salt route from the Black Sea to the central forest belt. Kursk, which lies on the River Seim, an affluent of the Dnieper drainage system, also stands about half-way between the sources of the Donetsk and Oka. To-day it is an important railway junction, where the line from Moscow to

Sevastopol, which traverses the plateau from north to south, is crossed by the Kiev-Voronezh line. Up to modern times it was famous for one of the most important fairs of mid-Russia.

Orel (110,000), which lies farther north on the plateau, though founded in 1564, also remains only a medium-sized town, in spite, of being a railway junction, the Moscow-Sevastopol line being crossed by the Riga-Smolensk-Stalingrad line at this point.

THE UKRAINE

The Ukraine S.S.R. is an administrative unit based on community of language and history, and is not a natural unit on the grounds of physiography or vegetation. It is true that the greater part of the Ukraine lies in the prairie and wooded-steppe regions, but the area north of Kiev is in the region of mixed forest, and is floored with glacial clays and sands instead of the löss of the steppes. The Ukraine is sometimes known as "Little Russia," in contradistinction to "Great Russia" of the Muscovy region, but the people rather resent this appellation and prefer to be called Ukrainians, meaning the "border" or "frontier" people.

The differences between the Ukrainians and the Great Russians are of the same order as those between the English and the lowland Scots. In fact, the speech is basically the same, though pronounced somewhat differently, while in Ukrainian there are more South Slav words and an absence of the Finnish words characteristic of Great Russian. In appearance the Ukrainians are often darker and less "Finnish," or, more properly, less "Lapp," than the Great Russians. The Ukrainians, unlike the Great Russians, tend to look towards Kiev as the centre of their national life. Moreover, contacts with the west were more apparent than in Muscovy; not only were the Tatar nomads driven from the Ukrainian steppe under Lithuanian and Polish auspices, but both literature and material culture showed Western influences (at least before 1917), while the people themselves migrated into the region very largely from the plateaus which lie to the north-east of the Carpathians. It is noteworthy that Poland held the land west of the Dnieper until 1793, with the exception of Kiev, which Moscow acquired in 1667. The Ukrainian people seeped eastward from Polesia, eastern Galicia, Volhynia, and Podolia during the seventeenth, eighteenth, and nineteenth centuries, and while outstripping Polish control they came eventually under the rule of Moscow owing to the break-up of the Tatar Khanates. The present boundaries of the Ukraine do not exactly correspond to the distribution of Ukrainian speech, there being considerable numbers of Ukrainians outside and considerable

numbers of "Great Russians" inside, while there are numerous descendants of Serb, German, and other immigrants, who were introduced under the colonisation policy of the Tsars.

The Ukraine is one of the most densely populated parts of the U.S.S.R., its 31 million people representing (in 1939) nearly 20 per cent. of the total population, though it covers only 2 per cent. of the area of the whole U.S.S.R. The Ukraine is famous not only for its agriculture, but for its mining and industrial development, and has the advantage of a long sea coast, which is frozen only for a comparatively short time, while the Dnieper has the longest navigation season of any Russian river.

Geographical Regions of the Ukraine. From the point of view of natural vegetation the Ukraine is divisible into three regions: (a) a small mixed-forest belt in the north where conifers predominated, (b) the wooded-steppe in the centre, and (c) the true steppe or prairie in the south.

The Mixed Forest Belt. This lies north of the latitude of Kiev ($50^{\circ} 30'$), and the subsoil consists of glacial sands and clays deposited in the old glacial "tongue-basin" of the Dnieper valley. The soils are either podsolised, or at best are brown forest soils. Woods and even forests still remain, and agriculture is concerned mainly with dairy-farming, with cereals occupying only a small acreage.

The Wooded-steppe and the Prairies. Together these constitute some of the most important grain lands of the U.S.S.R. The boundary between them is not clear cut; indeed, the plateau portion of the wooded-steppe west of the Dnieper is as devoid of trees as the prairie or true steppe, but generally speaking there is a contrast between the mixed and more intensive farming of the wooded-steppe and the somewhat precarious cereal-farming of the prairie. The yield per acre in the former is considerably higher and crop failures are not so frequent. Moreover, the wooded-steppe is a land of relatively old-established settlement. For instance, Kremenchug on the Dnieper was founded in 1571, and Kharkov in 1650. The boundary between the wooded-steppe and the prairie runs in a south-west to north-east direction, a little to the south of these two towns, and the greater part of the prairie was not colonised until the last quarter of the eighteenth century (e.g. Dnepropetrovsk, formerly known as Ekaterinoslav, was founded in 1783), and it remained uncultivated and devoted to "ranching" until the middle of the nineteenth century.

The wooded-steppe is divided into two parts by the River Dnieper. On the west are the plateau lands of Volhynia and Podolia, while on the east lies the plain of the middle Dnieper. The plateau, which is composed of sedimentary strata, underlain by the granites

of the Azov-Podolian massif, is highly dissected by incised river valleys and ravines. It closely resembles Bessarabia on the other (west) side of the River Dniester; it is similarly covered with a great thickness of *chernozem*, and is similarly treeless, except in the valleys. The plateau is swept by violent winds in winter, to such an extent that the railway track has to be protected against drifting snow by special palisades, while in summer the air is dusty, and streams tend to dry up. Nevertheless, the region is noted for its productivity, wheat and sugar-beet being produced in vast quantities, while vineyards clothe the sides of numerous valleys. (Note the place-names: Vinnitsa, Vinograd.) Orchard trees, restricted to the valleys, include apples, pears, plums, and cherries. Livestock and poultry are kept in considerable numbers. On the plain of the Dnieper the wooded-steppe is even more productive. The same crops are grown with the addition of tobacco, and as the water-table is nearer the surface, trees grow well. The whole region has long been noted for its air of prosperity. The villages, composed of thatched cottages with white-washed adobe walls, are set amidst orchards, every house having its own garden with flowers and vegetables, which include sunflowers, melons, and onions. The villages strongly resemble those of the Carpathian foot-hills, and are in marked contrast both to the timber-built villages of the central mixed-forest belt and the bare, gaunt villages of the prairie.

In the prairie, bordering the Black Sea and the Sea of Azov, agriculture is handicapped not only by the scanty rainfall, but by the great variation in the amount received from year to year. Moreover, in the areas where the old granitic core comes near the surface the soil is very thin. Except along the actual coast, and near the watery and wooded flood-plains of the great rivers, the land was very forbidding to agriculturists, and although it is now under the plough, yet disastrous crop failures are all too frequent. However, the presence of a large coalfield and great deposits of iron-ore and manganese provide alternative forms of economy.

Industrial Development in the Ukraine. Up to the war of 1941-45 the Ukraine was not only the most important agricultural region of the U.S.S.R., but also the most important industrial unit. This development was made possible by the great Donetsk coalfield which stretches from west to east on the southern side of the Donetsk river, and lies partly in the Ukraine and partly in the Rostov Oblast. The rich iron deposits in the crystalline complex at Krivoi Rog and the manganese ore near Nikopol, to the west of the Dnieper river, are also very important, and to a less extent the salt found in the Permian rocks near Slavyansk, north of the coalfield, and the mercury near Artyemovsk.

The Donetz coalfield (or Donbas), of Carboniferous age, was producing some 60 per cent. of the total Russian output of coal in the late 1930's, the actual tonnage mined in the Ukraine being 67 million tons in 1937 and 81 million tons in 1938. Although this was much larger than the 1913 output (23 million tons), yet the share of the Ukraine in 1913 was as high as 80 per cent., for the coalfields in the Asiatic part of the U.S.S.R. had not then been developed. The Donetz coalfield contains coking coal, gas coal, and anthracite, the last named mainly at the eastern end of the coalfield in the Rostov Oblast. Exploitation on a considerable scale began in the 1870's, following the construction of the railway



Photo B. Keller]

[From the *Journal of Ecology* by permission of the Editor

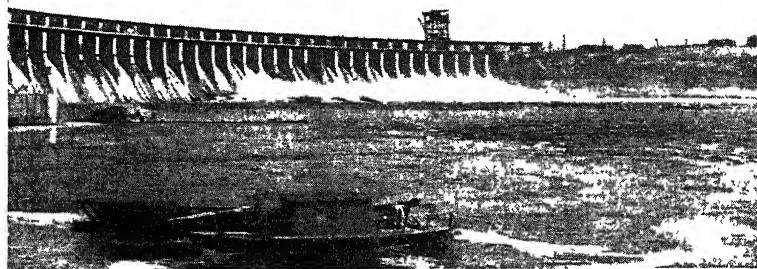
FIG. 149 —THE FLAT PLAINS OF SOUTHERN RUSSIA.

Fallow land beyond the vehicle.

from Kursk *via* Kharkov to Azov in 1870; a Welshman named John Hughes set up the first coke-fired furnace on Russian soil, and the town which was named after him remains the centre, and has become the largest town (462,000 inhabitants), of the Donetz industrial area, though the name has been changed from Yuzovka to Stalino. For a long time the area specialised in pig-iron and steel for the older established metallurgical industries of the Tula-Moscow area, but more complex metallurgy and engineering gradually developed, especially in the 1930's. Heavy chemicals are also produced. The immediate surroundings of the Donetz coalfield present more than one drawback to the establishment of large-scale

industry, notably the seasonal scarcity of water, while the land is agriculturally poor. The necessary iron-ore has to be hauled for considerable distances, either from Krivoi Rog, which lies about 225 miles west of Stalino, or from Kerch in the Crimea, which lies about 200 miles south of Stalino. The latter ore has a lower iron content and the output is smaller, but can travel a considerable part of the distance by sea.

The Donetz coalfield is the site of numerous smallish and medium-sized industrial towns, such as Slavyansk (76,000), Voroshilovsk (55,000), Artyemovsk (55,000), but there are only two really large towns, Stalino and Voroshilovgrad, formerly Lugansk (213,000). Many of the towns near the salt mines have chemical, glass, and ceramic industries.



[Photo: Lettice Ramsev]

FIG. 150.—THE GREAT DAM AT DNEPROPETROVSK (EKATERINOSLAV) ON THE DNEIPER.

There is also a considerable amount of industrial development in other parts of the Ukraine; ferrous metallurgical work at Krivoi Rog, Dnepropetrovsk, Zaporozhe, and at the ports of Odessa Nikolayev and Mariupol. Heavy engineering is carried on in the great cities of Kiev and Kharkov. The harnessing of the River Dnieper by means of the great dam situated near Zaporozhe (*see above*) provided a new source of power, which was being utilised in the 1930's to establish new industries in the middle Dnieper area. The main types of industry were, first, engineering, and secondly certain industries which needed large amounts of electricity, such as aluminium, ferro-alloys, and the extraction of atmospheric nitrogen. Dnepropetrovsk (500,000) doubled in size between 1926 and 1939, while Zaporozhe grew from 56,000 to 289,000 in the same period.

One of the most astonishing changes of population grouping ever to take place in times of peace occurred in the Ukraine between the two censuses of 1926 and 1939. The urban population increased by about six million, chiefly at the expense of the rural population, who actually were four million fewer in 1939 than in 1926. This "flight from the land" was not looked upon as a disaster; on the contrary, it was regarded as a great step forward, since it resulted from mechanisation of the farms, and an increased output for a smaller amount of labour. Besides going to swell the numbers of towns already in existence, at least fourteen entirely new townships were established.

The Ukraine possessed in 1939 four cities each of over half a million inhabitants. Of these Kiev (846,000) and Kharkov (833,000) are respectively the third and fourth largest cities of the U.S.S.R. Kiev, picturesquely situated on the high right bank of the Dnieper, and in an excellent position for defence against attacks from the east, dates from the ninth century, and in the eleventh century was incontestably the capital of the Russian world. In spite of its eclipse under the Tatar conquest, Kiev eventually resumed its rôle as a leading cultural and religious centre. It is now the capital of the Ukraine, though Kharkov held that position during the first flush of revolutionary enthusiasm, with its characteristic desire to break with the past. Kiev's manufactures include heavy engineering, sugar, leather, tobacco, and printing. Kharkov, founded in the seventeenth century, has been developed rapidly, thanks to its excellent railway connections with Moscow, the southern coasts, and the Donetsk coalfield, together with its position in a densely populated countryside. It is growing more quickly than Kiev, and has similar industries, though it is particularly noted for electrical engineering, machine tools, and its great tractor plant.

The port of Odessa (604,000) is the third largest town of the Ukraine, and the seventh largest in the U.S.S.R. Founded in 1795 soon after the conquest of the coast from the Turks, Odessa rapidly became the leading Russian port on the Black Sea, exporting the agricultural produce of the Black Earth region, such as grain, oil-seeds, and later sugar. The city is not at the mouth of any river. The Black Sea coast is here bordered by lagoons and sand-spits, like the similar low, tideless shores of the Baltic Sea, hence it follows that the mouths of the greater rivers are shallow and partially cut off from open water by sand-bars, while the smaller streams have no visible exit at all. Good sites for ports are therefore few and far between. Odessa is ice-bound for a much shorter time than the river ports of Nikolayev (167,000), Kherson (97,000), and the Azov ports of Berdyansk (52,000) and Mariupol

(222,000). Odessa and Nikolayev carry on shipbuilding and marine engineering; Odessa also makes agricultural machinery and has oil refineries, tanneries, flour mills, and other food-processing industries.

The Lower Don Industrial Area. South-east of the Ukraine is the region round the lower Don, which is politically divided from the Ukraine, but is linked to it economically. Taganrog (189,000), on the Sea of Azov, has similar exports and industries to those of Mariupol, coal being a prominent export. Rostov-on-Don (510,000) has important manufactures of agricultural machinery and other industries; it is a collecting centre for goods from the Donetsk coalfield and those from the fertile and oil-producing Caucasus foreland.

CHAPTER XXXVI

THE LANDS ALONG THE VOLGA

THE lands along the Volga River from the town of Gorki (Nijni-Novgorod) to the Caspian Sea may be grouped together as the Povolzhye or Volga economic region (*cf.* Posavina and Podravina in Yugoslavia). Although these lands fall into several vegetation regions, *i.e.* forest (coniferous and mixed), wooded-steppe, prairie, and semi-desert, yet they have long been closely linked economically by the great artery of the Volga, which below Gorki is never less than half a mile wide, and is over two miles wide for the greater part of its middle and lower course.

The Volga carries about a quarter of all river-borne traffic in the whole of the U.S.S.R., although closed by ice in winter and impeded by sandbanks at low water in autumn, and from early times it has been a noted waterway, carrying salt, dried fish and Asiatic goods northwards and timber southwards. In modern times mineral oil has become the chief commodity carried, and about half of the total Volga traffic is concentrated in the stretch between the Caspian Sea and Stalingrad. Before the coming of mechanical propulsion the upstream journey was a slow and painful haul.

The Volga has significance for Russians not only as the greatest of all Russian highways, but also as the meeting-place of Muscovite and Tatar cultures, and the region still contains an appreciable number of Tatar folk, together with Tatarised Volga-Bulgars, Chuvash of doubtful affinity, and the Finnic-speaking Mordvans or Mordovians, and Marii, who were formerly subject to the Tatar Khanate of Kazan. The presence of these minorities was acknowledged by the creation of a number of autonomous republics, namely the Tatar, Marii, Mordov, and Chuvash A.S.S.R. The adjacent Bashkir and Udmurt republics, though not strictly in the Povolzhye region, also reflect the presence of other large non-Russian elements in the population. Although Kazan, the headquarters of the Tatars and the Tatarised Volga-Bulgars, fell to Ivan the Terrible in 1552, and the great emporium of Astrakhan was conquered in the same decade, yet actual Russian colonisation proceeded very slowly.

Russian settlement along the Volga was at first restricted to a number of forts which were established in the sixteenth and seventeenth centuries, but which remained purely military establishments until late in the eighteenth century. Samara (now Kuibishev) was founded in 1586, Tsaritsyn (now Stalingrad) in 1589, Saratov in 1599, Simbirsk (now Ulyanovsk) in 1648, and Syzran in 1684, but as late as 1799 Tsaritsyn had a population of little over a thousand souls (as against 445,000 in 1939), while even in 1851 Samara (Kuibishev) had only 15,000 inhabitants (as against 390,000 in 1939). Peasant pioneers gradually moved eastward across the Oka and settled in the forests and wooded-steppes on the Volga Heights west of the Volga, among the primitive Chuvash and Mordovians. East of the river the country was more open and in fact almost devoid of trees south of a line joining Simbirsk (Ulyanovsk) and Ufa; moreover, it had little surface water, while the best lands and the best watering places were already taken up by the Tatars, who though mainly pastoralists, also practised some agriculture. The river itself, particularly in the gorge-like stretch near Kuibishev, was haunted by pirates, who on more than one occasion joined with the oppressed peasants of the west bank, under the leadership of the free (and free-booting!) Cossacks, such as Stenka Razin in the sixteenth century and Pugachev in the eighteenth century, with the object of overthrowing the crushing feudal rule of Moscow. It was only during the latter years of the eighteenth century, and more especially during the nineteenth century, that Russian agriculturists settled in the prairies and parklands between the Volga and the Belaya rivers and reached out eastward along the Samara River to Orenburg (now named Chkalov), while up to very recent times the middle Volga area was considered a "poor, God-forsaken place, where drought, famine and a lack of culture in the inhabitants were the natural features" (S. P. Turin).

The wooded-steppes and prairies east of the Volga below Kazan have proved to be very productive grainlands in spite of periodic catastrophic droughts, but the poorer steppes and semi-deserts south of a line joining Saratov, Uralsk and Chkalov remain grazing lands, thinly populated by the Mongol Kirghiz, while the similar semi-deserts on the west bank of the lower Volga, below Stalingrad, are thinly populated by Mongol Kalmuks.

The actual banks of the river provide more favourable conditions for agriculture, or rather for horticulture, than the land farther away, owing to the greater shelter from wind and the facilities for obtaining water. The apple and cherry orchards of the middle stretch between Gorki and Kuibishev are noted, while grapes,

water-melons, peaches, plums, and apricots are widely grown lower down the valley.

Natural Regions. The Povolzhye does not divide neatly into the parallel vegetation zones which are encountered farther west. It is true that the southern margin of the coniferous forests, which occupy the northernmost section of the Povolzhye, runs roughly from west to east. This forest region, which stretches away to the north into the vast "backwoods" of the Zyrian (Komi) territory (*see* p. 443), reaches southward almost to the lower Kama, and to the Volga between Gorki and Kazan, but once the Volga has turned from its east-west course to its north-south course at Kazan, both relief and climate combine to produce different vegetation conditions on the west side of the Volga from those occurring on the east. Between Kazan and Ulyanovsk (Simbirsk) the natural vegetation on the west side appears to have been similar to that of the "mixed" forest zone of Moscow, while east of the river the woods were more open, and were entirely deciduous, and were in fact of wooded-steppe character; farther south, between Ulyanovsk and Saratov, the lands on the west side belonged to the wooded-steppe, while those on the opposite side were devoid of trees and belonged to the true steppe or prairie; farther south again, between Saratov and Stalingrad, the west side continued to have the advantage in showing prairie lands as against the untillable semi-desert on the east side. It naturally follows that agriculture also differs on either side of the river.

This asymetry is partly due to the dying out of Atlantic climatic influences towards the east, but the peculiar sharpness of the contrast on either side of the Volga axis between Kazan and Stalingrad is chiefly due to the presence of the Volga Heights. These reach a sufficient elevation (maximum 1,400 feet) to experience extra precipitation and slightly lower temperatures; in other words, the extra height gives rise to differences of climate, which though slight in themselves, are cumulatively able to cause very important differences in natural vegetation and therefore in agriculture. On the whole the balance of advantages lies with the western bank.

The asymmetric character of the actual banks of the Volga, with high cliffs on the west and low-lying flood plains on the east, serves to emphasise the differences already mentioned, for there is also a physiographic contrast between the dissected Volga Heights and the eastern plain. The difficulty of bridging the great river further leads to the conclusion that a real "frontier," or break in continuity, would occur along this line were it not for the facilities for transport afforded by the river itself.

As the Povolzhye area is obviously too large and too diverse to be treated as a single unit in any regional study, the following sub-divisions will be adopted: (i) the northern coniferous forest-lands north of the Volga-Kama junction, (ii) the Volga Heights, (iii) the tillable steppes east of the Volga, (iv) the semi-deserts and the Volga delta.

(i) The Coniferous Forest-lands north of the Volga-Kama Junction.

As mentioned above, the coniferous forest region reaches almost to the lower Kama River and to the Volga between Gorki and Kazan. For the sake of convenience these rivers in the sections mentioned will be taken as forming the southern boundary. The region is drained principally by the Vetluga tributary of the Volga and the Vyatka or Kirov tributary of the Kama and is mainly low-lying land with no outstanding relief features. Timber is shipped down these rivers and the Volga, the trade being a very ancient one. Soils and agriculture are similar to those of the Vologda and Ivanovo regions (*see pp. 443, 448*). Much land is devoted to the cultivation of flax, rye, hay, root-crops, and similar products of the forest clearings, and dairy cattle are relatively important. Industry is mainly occupied with the working up of the poorer timber into cellulose and paper. Small quantities of iron-ore are mined near the headwaters of the Vyatka, and deposits of phosphates, said to be the largest in the U.S.S.R., occur between the Vyatka and the headwaters of the Kama.

The main importance of the area in past times lay in its position on the route to Siberia *via* the Sukhona, Vyatka, and upper Kama Rivers, and to-day it is relatively less important than it was during the Middle Ages. This northern route was developed by fur and salt traders from Novgorod as early as the thirteenth and fourteenth centuries, when the more southerly route *via* Kazan and the lower Kama (later used by the Muscovites) was still in the hands of the Tatars. A main railway line now traverses this region from west to east; lines coming from Moscow *via* Gorki and from Leningrad *via* Vologda unite at Kotelnich on the Vyatka or Kirov River, thence the line goes eastward to Kirov, an old fortress town formerly known as Vyatka, and thence to Perm and the Urals. Kirov (143,000), the only large town of this region, is an important route and manufacturing centre, but was small until the railway era, having only 15,000 inhabitants in 1860. In addition to its paper and other timber industries, it prepares sheepskins and manufactures the sheepskin garments which are well-known throughout Russia. There are no other urban centres of any size, Yoshkar-Ola (formerly known as Krasnokokshaysk and earlier as Tsarevokokshaysk), the capital of the Marii A.S.S.R., having less than 10,000 inhabitants. Population densities are about the same as those of similar agricultural

regions in the same latitude, such as Estonia and Latvia, *e.g.* Kirov Oblast 54 per square mile, the Marii and Udmurt A.S.S.R. 65 and 80 per square mile respectively in 1939. (*cf.* Estonia and Latvia =61 and 81 per square mile in 1940.)

(ii) **The Volga Heights.** The Volga Heights (more properly the Volga plateau) are discernible on the right-hand bank of the Volga, some little distance below Gorki, and stretch southwards almost to Stalingrad. On the west they rise imperceptibly from the Don lowlands, but on the east they fall abruptly to the Volga River. Few travellers on the Volga have failed to record the impressive picture afforded by the lofty right bank which reaches heights varying from 300 feet to 900 feet above river-level, sometimes falling steeply in cliffs, sometimes sloping back from the river in wooded hills. This steep face is seamed by numerous valleys and ravines in which nestle picturesque villages, whose wooden houses cluster among trees beneath the characteristic green cupola of the village church.

Although seldom attaining more than 1,000 feet in height, yet the Volga plateau, especially in its northern part north of Syzran, displays more variety of relief and rock formation than any other region of similar size on the Russian Platform. The plateau is deeply dissected, the rivers flowing in incised valleys which are especially deeply cut between the Sura and the Volga, and in the Zhiguli Heights.

The Zhiguli Heights, reaching over 1,200 feet, lie within the great bend made by the Volga near Kuibishev (Samara). They owe their origin to faults which have brought Carboniferous and Permian rocks to the surface on both sides of the Volga, and here in the "Samara Gate" occurs the only stretch of the river on which *both* banks are lofty. The Permian formation is also found in the northern part of the plateau, where gypsum beds occur which are pitted with swallow holes into which the rivers disappear. Farther south occur sands and marls of Jurassic age, which in turn are succeeded southward by pure white chalk, sometimes capped by Tertiary sands. The superficial deposits show a significant variety, degraded *chernozem* not only alternating with clay-with-flints, but itself varying considerably in texture from place to place, being generally more sandy and less rich in humus than in most parts of the Black Earth regions. On the other hand, the southern and south-western parts of the plateau, *e.g.* round Penza, have large areas with little variety of relief and with good "Black Earth." The difficult nature of the dissected and formerly forested country between the Sura and the Volga seems to have been a factor in enabling the Chuvash to preserve their primitive mode of life and their individual characteristics until a late date; west of the Sura

the forests which sheltered the Mordovians seem to be connected to a considerable extent with the deposition of fluvio-glacial gravels in the Don tongue-basin, though the relief is also somewhat broken. Incidentally the Mordovians, though small in numbers outside their autonomous republic, are scattered throughout the central parts of the Volga plateau among the Russian settlers.

Trees grow easily on the plateau as far south as Saratov, with extensions southwards along the Kholer and Medveditsa tributaries of the Don. Owing to the diversified terrain and the possibility of tree growth, a great variety of crops can be grown in the northern parts of the Volga Heights, although owing to the high density of population and the consequent great pressure on the land, the peasants of former days had to concentrate on subsistence crops. Mixed farming (with such crops as flax, hemp, sugar-beet, potatoes), dairy-farming, and fruit-growing were being developed in the 1930's.

Although the Volga Heights show a high density of rural population (155 per square mile in the Chuvash A.S.S.R., 119 in the Mordovian A.S.S.R.) there are no towns of any size except Penza, since urban settlement is irresistibly attracted to the main line of movement, the Volga. Penza (157,000), an important route centre, where the main line from Moscow to Kuibishev and Chkalov (Orenburg) crosses the upper Sura, has flour-mills, woollen-mills and tanneries, using raw materials from the surrounding area. The capitals of the Chuvash and Mordovian A.S.S.R. are both small. Cheboxari, capital of the former, is a small Volga town of less than 10,000 inhabitants; Saransk, the Mordovian capital, lying west of the Sura River, has a recently installed milk-preserving combine, which indicates the type of agriculture of this formerly well-wooded area.

(iii) The Tillable Steppes East of the Volga. East of the Volga and south of the Kama the land stretches for mile after mile in plains and low plateaus, whose rich "Black Earth" is as suited to the cultivation of cereals as the similar soils of the Central Black Earth region and the Ukraine, but where the uncertainty of the rainfall renders agriculture a very hazardous undertaking. The average annual rainfall varies from about 12 inches in the south (e.g. at Uralsk) to about 17 inches in the north (e.g. along the Kama), but unfortunately the variation from year to year is very great. The worst disaster occurred in 1921 when thousands of people in the middle and lower Volga region perished from famine.

The wooded-steppe with a slightly higher precipitation, roughly north of a line joining Ulyanovsk and Ufa, allows for a greater variety of crops since the danger of drought is not so acute. This

is reflected in the higher population density (*cf.* 114 per square mile in the Tatar A.S.S.R., as against some 60 per square mile east of Kuibishev, and 36 per square mile in the Chkalov Oblast in the south of the tillable steppe). The southern margin of the Black Earth and also of widespread sedentary life is to be found near the railway line connecting Saratov and Chkalov.

The wooded-steppe region, which lies mainly in the Tatar A.S.S.R., is suited to mixed farming, and has had a relatively prosperous past. Industries dependent on agriculture, such as the production of soap, candles, leather, and felt boots, have long been established here.

Farther south, in the treeless parts of the Saratov and Kuibishev Oblasts which lie east of the Volga, the production of cereals has been almost a mono-culture; the arable land was customarily devoted to small grains for several years and then left fallow for several years to allow it to recover. About 40 per cent. of the land lay fallow every year up to 1917, and this gave time for moisture to accumulate in the soil. Peasant farming was at a disadvantage in this type of region, which seems much better suited to extensive, mechanised farming; collective farms have been established here on a large scale. Horses, sheep, and some cattle are reared.

Population is mainly agglomerated in very large gaunt villages sited where water is available. The "Great Volga" scheme envisages the irrigation of large tracts of land on the east bank between Kuibishev and Saratov, but as the steppe lies about 200 feet above the river a great deal of pumping would be necessary, and this in turn would necessitate the harnessing of the river, *e.g.* at the Kuibishev "narrows," to provide cheap electric power. There are no towns of any size except on the margins, *e.g.* Kuibishev (390,000), Chkalov (173,000), Pokrovsk (Engels; 73,000), Uralsk (66,000), Ufa (246,000), though the small centres of Buguruslan, Buzuluk, and Kinel bear witness to the late eighteenth century policy of fortified settlements. Ufa, in the vicinity of important oilfields, is the capital of the Bashkir A.S.S.R.

South of the Saratov-Uralsk-Chkalov railway the "Black Earth" gives place to the chestnut soils, and the moisture available is too small for cultivation, except along the main rivers and a few *wadis*, which flow towards, but never reach, the Caspian Sea.

(iv) **The Semi-deserts and the Volga Delta.** The semi-deserts stretch on both sides of the lower Volga below the elbow bend by Stalingrad. On the west, the scarp of the Ergeni (a Kalmuk word meaning "heights") marks the approximate boundary between the "desert and the sown," while east of the Volga the Torgun and Eruslan, feeders of the Volga (*c. lat.* 50° N.), mark the southern limit of cultivation. Although not without surface water immediately

after the snow has melted, moisture rapidly sinks into the permeable sandy soils, or evaporates leaving saline deposits where the soil is less permeable. In some places true desert with moving sand-dunes occurs, but in most areas there is sufficient vegetation for nomadic flocks of sheep, kept by the Buddhist Kalmuks on the west of the Volga, and the Moslem Kirghiz or Kazaks on the east. The population density in the semi-desert is very low, less than 12 persons per square mile.

Through this inhospitable region runs the lower Volga in a network of channels, a watery belt which strongly resembles the "balta" and delta of the Danube (*see* p. 380), and has been compared by some authors to Upper and Lower Egypt. It must, however, be



Photo: B. Keller]

[From the *Journal of Ecology* by permission of the Editor

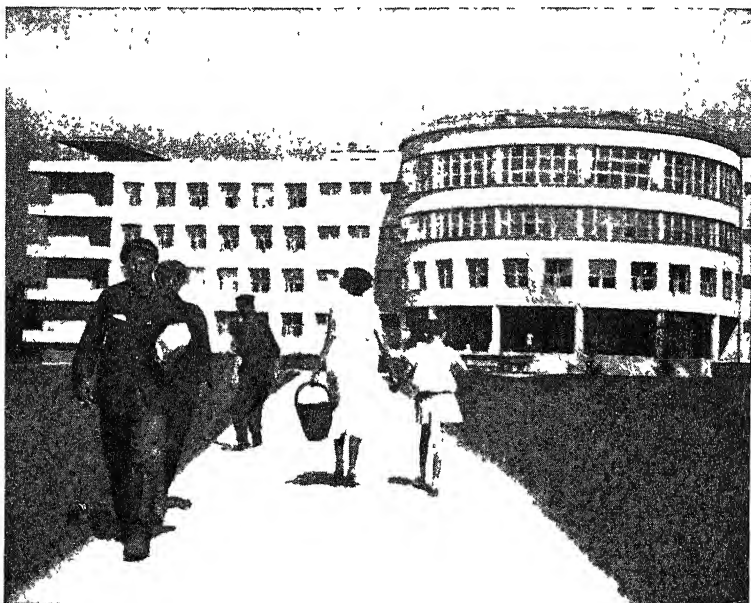
FIG. 151.—THE ERGENT HILLS BORDERING THE CASPIAN DEPRESSION.
Salt Steppe in the foreground.

remembered that the Volga is frozen on an average for 21 weeks at Stalingrad, and for 15 weeks at Astrakhan, so that plant-growth comes to a standstill during the winter months. On the other hand, summers are very hot and, although much of the broad flood-plain and delta lies under flood-water in May and June, the area provides an oasis of cultivation and sedentary life. Semi-tropical crops can be grown, and on the drier margins peach and apricot trees flourish, together with the vine. The lagoons and distributaries of the Volga, like those of the Danube, abound with water-birds, as well as with various types of sturgeon which yield the famous caviare.

Towns of the Povolzhye. All the large towns of this area are situated on the Volga with the exceptions of Penza, Uralsk, and Chkalov.

Most of the cities originated as fortresses, but developed as administrative and market centres. As elsewhere in Russia the coming of the railway greatly assisted their growth, and the towns situated where the five main trunk lines cross the great river are naturally in an exceptionally favourable position.

In the north the two outstanding urban centres are Gorki (Nijni-Novgorod) and Kazan. Both are old historic cities, which have taken on a new lease of life with the industrialisation of the U.S.S.R. Gorki (644,000 in 1939 as against 222,000 in 1926) lies at the extreme



[Courtesy Society for Cultural Relations with the U.S.S.R.]

FIG. 152.—NEW BUILDINGS AT GORKI (NIJNI-NOVGOROD).

west of the region under discussion, and at the extreme east of the old Great Russian lands. By virtue of its position at the junction of the Volga and the Oka it possesses great natural nodality, and it also proved a favourable market place for goods coming along the Volga and Kama from various parts of Asia. Furs (from Siberia), tea (from China), silks, carpets, and raw cotton (from Turkestan), wine (from the Caucasus) were among the many things sold at its celebrated fair which flourished during the nineteenth century. At the present day it is noted chiefly for its huge engineering works which make automobiles, aero-engines, diesel motors, and so on. Kazan (402,000 in 1939 *versus* 179,000 in 1926), the

capital of the Tatar A.S.S.R., already an old trading and administrative centre under the Tatars, became a fortified outpost of Russian culture. It possesses a "Kremlin" and claims to rival Moscow in magnificence and picturesqueness. Its noted university, founded in 1804, has a strong department of oriental studies, and among the industries of the city is the mass production of type-writers with *Latin* characters for the use of the various national groups of Turki speech. The manufacture of synthetic rubber, rolling-stock, and agricultural machinery are among the chief industries of the city, which lacks both fuel and minerals in the immediate vicinity, but has the advantage of excellent communications, thanks to the Volga river system and the recent extension of the main-line railway from Moscow to Sverdlovsk (which crosses the river at this point). It is worth noting that Kazan is one of the very few big *left* bank towns of the Volga, a natural position for a Tatar city; a slight eminence gave security from floods, but at low water the city is some four miles from the edge of the river.

Ulyanovsk, formerly Simbirsk (102,000 in 1939 *versus* 70,000 in 1926), is situated on the Volga, where it is crossed by the railway from the Moscow region to Ufa and the Zlatoust route across the Urals. Between Simbirsk and Ufa this railway roughly marks the dividing line between the wooded-steppe to the north and the true steppe to the south. Like Syzran farther south, Ulyanovsk works up various local agricultural commodities, *e.g.* leather and wool, as well as the timber coming down the Volga, while in recent years the manufacture of machine tools has been added. Syzran (78,000) is overshadowed by its more powerful neighbour Kuibishev (390,000 in 1939 *versus* 176,000 in 1926). Both towns lie on the main trunk line from Moscow which, in fact, branches east of Kuibishev, sending one line south-east to Chkalov and another north-east to Ufa. As already mentioned, Kuibishev is picturesquely situated on the left bank of the Volga, where high land occurs as the result of faulting. The town has been a collecting point for the grain lands east of the Volga since the establishment of steam navigation on the river (*c.* 1820), and is noted for grain elevators and flour-mills. Other industries were mainly concerned with the working up of agricultural produce (brewing, macaroni manufacture, etc.), but engineering (*e.g.* vehicles, aeroplanes) has been added in recent years. The removal of the administration from Moscow to Kuibishev during the war of 1941-45 emphasises both its distance from central Europe and its excellent communications with the non-European parts of the U.S.S.R.

Saratov (376,000 in 1939 *versus* 220,000 in 1926), which was the largest city on the Volga until the 1930's, has sunk to fourth in

size in spite of a 70 per cent. increase in population. It remains an important distributing centre for grain, timber, salt (from the semi-desert), tobacco, fish, tallow, and skins, and retains flour-milling, oil-refining, and tobacco manufactures. Engineering, including the manufacture of agricultural machinery, aeroplanes, and ball-bearings, is a new development. Saratov is at the lowest bridging point of the Volga.

Opposite Saratov was the former capital of the Volga Germans, namely, Engels (Pokrovsk; 73,000).

Stalingrad, formerly Tsaritsyn (445,000 in 1939 *versus* 151,000 in 1926), was selected for industrial development by the Soviet authorities, and has exploited its nodality at the convergence of the three railway lines which tap the Volga at this point, for the town numbered only 6,700 inhabitants in 1861. The railways link the river with (a) Moscow and central Russia, (b) the Donetz coal-field, (c) the Black Sea at Novorossisk. Some of the oil from the Baku fields is transferred from the Volga steamers to the rail at this point, and oil refineries are established here, timber from the north is transhipped here for the Donetz coalfield, and coal from the latter is transferred on to the river. The first Five-Year Plan brought about the great industrial development for which the city became noted, the huge tractor works, power-stations, steel plant, new saw-mills, and petroleum refineries. There is no bridge across the Volga here, no doubt because of the great width of the river, combined with the unproductive nature of the semi-desert on the eastern side. The completion of the Volga-Don canal will further improve the city's communications.

Astrakhan (254,000) stands on an island in the delta on the left bank of the main distributary. It is the meeting-place of sea and river transport. It is the centre of the world-renowned sturgeon fisheries, and is a distributing centre for salt and petrol. A railway running through the semi-desert, *via* the salt lakes Elton and Baskunchak, gives the town communications with Saratov *etc.* at all seasons, while a new line provides a link with the Caucasus *via* Kizlyar.

CHAPTER XXXVII

THE PERIPHERAL MOUNTAINS OF EASTERN EUROPE: CRIMEA, URALS, CAUCASUS

The Crimea. Separated from the mainland by the narrow Perekop isthmus, the north of the Crimean peninsula continues the poor dry steppes characteristic of the southern Ukraine. Three-quarters of the Crimea is occupied by this plain. Southwards, the land gradually rises to barren limestone mountains which drop towards the south-east coast by a series of steep scarps, separated by depressions which become more productive towards the south-east. The lower slopes of the mountains are clothed in trees, and productive agriculture, sometimes irrigated, is found in the depressions. The capital of the Crimean republic is Simferopol (147,000), with fruit-preserving and other alimentary industries. Sevastopol (120,000), on the south-west coast, is a naval base. The most productive and thickly populated part of the peninsula is the south-east coastal strip, which is so sheltered from the cold north winds that it enjoys exceptionally mild winters and a "Mediterranean" type of climate.

This "Riviera" region is unique in Russia, and its fame as a health and holiday resort is widespread. Yalta is perhaps the best known of its small, attractive, coastal towns. Eastwards the land falls to the low dry peninsula of Kerch, celebrated for its iron mines. The town of Kerch (104,000) has iron and steel plants.

The Ural Region. As already mentioned in Chapter XXXII, the northern Urals are largely undeveloped, but the central and southern sections are becoming increasingly important. In the low central section economic life is focused on Sverdlovsk (formerly Ekaterinburg), the old gateway to Siberia and starting point of the Trans-Siberian railway. The town grew from 134,000 in 1926 to 425,000 in 1939, mainly owing to the great development of heavy industry and engineering. It draws on the iron, copper, gold, nickel, manganese, bauxite, and other ores which are mined both to north and south, mainly on the eastern side of the Urals, and derives some of its coal from the Kizel mines on the western side of the Urals near Solikamsk. As the latter coal is sulphurous and not of very good quality, Sverdlovsk is largely dependent on coal from Siberian sources,

particularly from the Kuzbas, over a thousand miles away. Local lignite and peat are also utilised. Besides being a large producer of pig-iron and steel, Sverdlovsk's industries include great quantities of machinery, machine tools, electric apparatus, and railway equipment. Nizhni Taghil (159,000), some 75 miles farther north, is situated near famous platinum deposits and the great iron mountain of Mt. Blagodat. It also has heavy metallurgical works, together with railway wagon works, saw-mills, and cement works. Kamensk, to the south-east of Sverdlovsk, has the largest aluminium plant in the U.S.S.R.

Even greater industrial development has taken place in the southern part of the Urals. The forested ranges and valleys round Zlatoust actually had important blast-furnaces in the eighteenth and early nineteenth centuries, but these charcoal-fired furnaces were unable to survive competition from the coke-fired furnaces of the developing Donetz coalfield. Zlatoust (100,000), a relatively old industrial centre in the inner Urals, has added the manufacture of high quality steels and ferro-alloys to its nineteenth century armaments industry, but has been far surpassed industrially since the 1930's by newer centres on the eastern and southern flanks of the Urals. Previously, the rich ores of the latter areas were virtually unworked owing to the shortage of fuel, and also of man-power and communications. Improved rail facilities and large-scale importations of labour from the older industrial areas are now overcoming these difficulties. Four types of power supply have been made available; coal from the distant Karaganda and Kuzbas fields, petroleum from the "Second Baku," local lignite and peat converted into electricity, and hydro-electricity from the mountain streams. Chelyabinsk (273,000), formerly a sleepy little provincial town, has great iron and steel works, rivalling those of Gary in U.S.A., a large ferro-alloy plant, zinc foundries, and a great tractor works. The new town of Magnitogorsk (146,000 in 1939) did not exist at the 1926 Census, but continued to grow enormously between 1940 and 1945. Its *raison d'être* was the famous Magnet (Magnitnaya) Mountain, one of the world's greatest deposits of iron-ore, believed to contain 450 million tons of high grade magnetite ore. Planted in the once lonely valley of the upper Ural River, the town is now the most important single iron and steel centre of the U.S.S.R., and one of the largest in the world. Industrialisation is also proceeding apace even farther south, and another great metallurgical centre is being created at Orsk-Khalilovo, which in addition possesses chemical industries; a pipeline connects this centre with the Emba oilfields. With the overrunning of the Donetz coalfield by the Germans in World War II, the newly industrialised Urals became the chief metallurgical

armaments workshop of the U.S.S.R., and the region is likely to play an increasingly important rôle in Russian industry.

The Caucasus Mountains and Adjacent Regions. This mountain range, with its associated foreland to the north and the Transcaucasian depression to the south, is separated from the populous Black Earth regions of the Ukraine, lower Don, and Volga by a thinly populated tract of poor soils, low rainfall, and scanty population. The Caucasus region may be regarded as a complex area comprising three main types of structure and land-forms, (a) a relatively level but somewhat dissected foreland of young sediments at the northern foot of the Caucasus Mountains, similar in origin and build to the Alpine Foreland; (b) the great young folded mountains of the Caucasus proper; and (c) the tectonic depression to the south of that system.

Russian colonisation began comparatively late in this area, and is still chiefly confined to the northern foreland, and especially to its western section in the Kuban drainage area, which received large numbers of Russian colonists during the middle and latter part of the nineteenth century.¹

The Northern Foreland. There are considerable differences between the western and eastern sections of this foreland. Although the natural vegetation is steppe in both sections, yet the Kuban region has a heavier precipitation, better distributed throughout the year than the eastern Kuma-Terek region, and has fertile Black Earth in contrast to sandy and salt impregnated soils. Agriculture, therefore, can flourish in the Kuban, while it is precarious farther east. The Kuban was one of the few areas of Russia which had large and prosperous peasant farms in pre-revolutionary days, and made considerable use of farm machinery. The present State and collective farms continue to grow large quantities of wheat, maize, and sugar-beet, while the soya bean appears to succeed well, and experiments are being made with kenaf, a new textile plant. In many ways the Kuban recalls the western Ukraine with its great variety of crops, its livestock, and its prosperous villages with their orchards and gardens, but the higher summer temperatures permit the cultivation of sub-tropical annuals, such as rice and cotton, where water is plentiful.

The eastern half of the foreland is still mainly the domain of the nomadic Nogai Tatars, though there is some agriculture in the Kuma and Terek valleys, and more especially in the better watered foothills south of the Terek. The eastern part of the foreland is richer in mineral oil than the western part, and oil is piped from the large

¹ As many as 54,000 Russians immigrated in the single year of 1872.

Grozny oilfields eastwards to the Caspian, north-west to Rostov-on-Don, and westward to Tuapse on the Black Sea. A pipeline also connects the last-named port with the western fields which lie between Krasnodar and Maikop.

Urban life is not greatly developed in either section. Krasnodar (204,000), in the west, is the chief administrative, commercial, and industrial centre; Novorossisk (95,000), a large manufacturer and exporter of cement, is the chief seaport. Farther east Ordzhonikidze (formerly Vladikavkaz, *i.e.* "the gateway to the Caucasus"; 127,000) is the starting point for two of the most important roads across the Caucasus. Grozny (172,000) has large petroleum refineries.

The Caucasus Mountains. Physically, the Caucasus Mountains consist of a crystalline backbone, largely granitic, which runs as a single wall across the Caucasian isthmus. The flanking ranges are shorter, and though more or less parallel, they are generally arranged *en échelon*—that is to say, they tend to die out at one end and to be succeeded by another ridge which slightly overlaps.

On the north, the principal parallel range of Bokovoy (which simply means "flanking" in Russian) is higher than the main chain, and gives rise to some of the most notable peaks—namely Mts. Elbruz 18,467 feet, Koshtantau 17,050 feet, and Kazbek 16,540 feet. There are said to be some seventy passable foot-tracks across the Caucasus, most of which, however, are blocked by snow for eight or nine months each year. Apart from the low north-western section of the Caucasus there is no railway and only one motor road, the so-called Georgian Military Road, which links Ordzhonikidze on the north with Tbilisi (formerly Tiflis) in Transcaucasia on the south. It has to climb about a thousand feet higher than Napoleon's famous Simplon military road in the Alps. The classical land route, now followed by a railway, by-passed the mountains by traversing the Caspian shore *via* Derbent, though in recent years a motor road and a railway have been built with some difficulty along the Black Sea shore. The flanking seas continue to afford the best highways.

Like the Alps and Pyrenees, the Caucasus Mountains are not very rich in minerals, as far as is known, though molybdenum and tungsten ores are mined at Tyrny Auz, near Nalchik, and zinc near Ordzhonikidze. They possess great reserves of timber and water-power.

The Caucasus Mountains are scantily populated except in a few limited areas, but the diversity of language, customs, and traditions is very great. People of Turki, Armenian, Iranian, and Mongol origin are found, together with Georgians and Ossetians who are

nearer to Europeans in language and probably in race. None of the people was Slavonic-speaking before the Russian conquest in the nineteenth century. The remoter valleys contain tribal communities which have lived in isolation for many centuries, but nevertheless, some of the highland people, such as the Georgians and Circassians, have long been in the habit of seeking their fortunes in the surrounding countries.

Transcaucasia. At the southern foot of the Caucasus Mountains lies the sheltered tectonic depression drained by the Rion to the Black Sea and by the Kura to the Caspian. It is not, however, a simple furrow, and lacks unity alike of climate, relief, and peoples. The western end of the depression drained by the Rion, together with the Black Sea coast south of the Caucasus range, is known as Kolkhiz (Colchis of the Ancient Greeks). The region receives a heavy annual rainfall, varying from 50 to 100 inches, and has relatively high temperatures, averaging about 75° in July and August, and about 45° in January, the latter being exceptionally high for the U.S.S.R. This humid "sub-tropical" climate permits the cultivation of tea and citrus fruits, as well as tobacco and rami, while the luxuriant forests of the mountain slopes provide another source of revenue.

Farther east, between the alluvial valley of the Rion and the alluvial lower valley of the Kura, lies a belt of hilly, even mountainous, country, whose high broken relief, poor soils and only moderate rainfall provide a totally different environment. Subsistence farming, with an emphasis on livestock, especially sheep, is the dominant note in this region which forms the heart of Georgia, though Tbilisi (Tiflis; 519,000), the capital, lies farther east in a fertile basin on the upper Kura.

The lower alluvial valley of the Kura lies in Azerbaidzhan. The natural vegetation is steppe, as the plain is cut off from the rain-bearing winds by the surrounding mountains. Winters are more liable to frost than those of Kolkhiz, but summers are even hotter so that annual crops such as cotton and rice are grown on a large scale under irrigation. The surrounding foot-hills are less arid than the valley, and maize, orchard trees, and the vine will grow without irrigation.

In addition to agriculture it seems likely that Transcaucasia will develop considerable manufactures. An area of relatively high population density and old handicrafts, it has the additional advantages of increasing supplies of hydro-electricity, considerable quantities of industrial crops, *e.g.* cotton and wool, and considerable mineral wealth, *e.g.* manganese near Chiatura in Georgia, copper in the Armenian S.S.R., and finally the vast oil resources of the

Aspheron peninsula near Baku. The oil occurs at the junction of the plain with the Caucasus folds, in Oligocene grits and sandstones beneath a capping of younger limestones and clays. The oilfield is one of the richest in the world, the annual output averaging 25 million tons. It has made the fortune of Baku (809,000), the fifth largest town of the U.S.S.R. Baku, an ancient Persian foundation, has been revived by its new industries, especially oil-refining and its exports of the "black gold," but it also possesses engineering, timber, cotton-textile industries, and flour-mills. It is also the intellectual and administrative centre of Azerbaidzhan.

South of the Rion-Kura depression rises the Armenian plateau, which averages 5,000-7,000 feet in height, with isolated volcanic massifs rising above it. From this plateau, historic and relatively easy passes lead to the Iranian and Anatolian plateaus.

CHAPTER XXXVIII

HISTORICO-ECONOMIC SUMMARY OF THE U.S.S.R.

IN spite of the apparent great break with the past which took place in 1917, the clues to much of the present-day life of the U.S.S.R. are to be found in history. For instance, the large number of autonomous republics stems from the fact that the Russians are recent intruders into the lands of other peoples, even in much of the "European" section west of the Urals, their settlements until the seventeenth century being confined to the central wedge of mixed-forest and wooded-steppe west of the Volga. Again, the dominance of the Moscow region dates from the historical fact that the conquering Tatars entrusted the princes of Muscovy with the collection of tribute from all the minor Russian rulers, and provided them with cavalry to enforce this collection. Many features of Russian life which seem curious to Western eyes date from her long contacts with the East rather than with the West; among these may be mentioned the Byzantine form of Christianity which, with its emphasis on asceticism and ritual rather than on ethics, its support of an oppressive autocracy, and its failure to be touched by the Renaissance, the Reformation, the Counter-Reformation, or the Humanitarian movements of the West, eventually alienated the Church from the people and brought it into contempt.

The effort to reach the sea, particularly an ice-free sea, has been a recurrent *motif* in Russian history, dominating alike the mediæval princes of Kiev and the Tsars from Peter the Great onwards, and is clearly discernible in the post-1944 policy of the U.S.S.R. Russia's long and historic remoteness from the sea may be adduced as one of the major causes of Russian aloofness from western Europe. On the south, Tatars and Turks barred the way to the Black Sea; on the west, Lithuanians, Swedes, and Finns barred the way to Moscow's nearest coast, the Baltic; the great northern forests rather than the few Finnic inhabitants barred the way to the White Sea, and it needed an Englishman to show the Russian landmen their northern sea-route.

Russian aloofness from the West was further strengthened by the early expansionist tendencies of her western neighbours,

Lithuanians, Poles, and Swedes. Unlike the Tatars, who made no attempt to settle in the forest or to convert the Russians to their own ways of thought, the western peoples tended both to settle and to proselytise and thus were actually more feared and disliked than the Mongols. Pressure from the west had the effect of directing Russian expansionist movements eastward, and once the Tatars were conquered in mid-sixteenth century, there were only weak, primitive tribes to oppose the Russian advance right across the three thousand miles of Siberia. The Pacific coast was actually reached as early as 1639, more than sixty years before a foothold was obtained on the Baltic coast, and nearly 150 years before the Sea of Azov was attained. Small wonder, therefore, that the Russians looked eastwards and tended to turn their backs on the West; satisfied with their own achievements they failed to appreciate western Europe's persistent habit of regarding them as backward.

Nevertheless, Russia paid the penalty for this neglect of the West in a very retarded economic and social evolution. Serfdom, which was widespread in Russia, was abolished only in 1861, and at the Revolution of 1917, the Russians, unlike the English, could look back on no long history of sturdy independent farmers, on no numerous, capable and hard-working middle-class, and on no democratic Parliamentary traditions. Moreover, agriculture, industry, transport, and education were all greatly behind those of the countries of western Europe.

The present economic geography of the U.S.S.R. presents a unique picture in that all agriculture, industry, transport, and commerce are in the hands of the State and all the land is State-owned. The State itself consists of a federation of republics, each nominally governed by a number of soviets, or workers' councils, which send delegates to the Soviet Congress in Moscow, but power is vested in the Præsidium of the Central Executive Committee, itself controlled by the Politburo of the Communist Party.

It may be said that, in theory, Russia has undergone a process of "rationalisation" similar to that recently adopted by some of the great manufacturing companies of western and central Europe and of North America, but among other differences, in Russia the process involved a whole country of eight million square miles and 195 million people (including the Asiatic section), and no one is allowed to leave the firm. Such a process of rationalisation, known as state socialism when applied to a whole country, would tax the best brains of a land where the level of education stood high and whose leaders had already had long experience of organisation. There is no need for wonder, therefore, that the new system, introduced in 1917, resulted for many years in a great falling off in

production, even though the pre-1914 level was already very low in comparison with those of the countries of central and western Europe.

This decrease in productivity may be attributed more particularly to four causes: (i) the disturbances of war, including the civil war, (ii) the large amount of time and energy consumed in establishing the new system and in experimenting with different methods of collectivism, (iii) the loss of talent involved in the suppression and persecution of "intellectuals," and (iv) the difficulty of obtaining foreign capital for a country which had repudiated its former debts. The production level of 1913 was practically re-attained in 1930, according to Soviet statistics, but in the interval the population suffered great miseries from the prevailing shortage of clothing, fuel, housing, and of the other necessities of life.

It must be remembered, however, that conditions of life in Russia at the end of the nineteenth century had changed very little since the Middle Ages, that the standard of living was very low, and that privations which would have been regarded as intolerable by people of western Europe were borne by the majority of Russians with docility. It may be said without exaggeration that the ideas of the French Revolution, of the Agricultural Revolution, and of the Industrial Revolution reached Russia at much the same time. In the twenty years or so before World War I the stirrings of new life were apparent and the country was being slowly reorganised on Western lines. Agriculture was then, as it still is, the staple industry of Russia, but was in a very backward condition, except on the estates of the great landowners, which were situated mainly in the Black Earth belt. The old "three-field system" prevailed over most of the ploughed land. Even where enclosures had taken place the peasants were not in a much better position than before, owing to the smallness of their holdings, their primitive implements, and their ignorance of modern methods of tillage. As regards manufacturing industries Russia had a good natural endowment of motive power (particularly of oil and coal) and of raw materials (particularly of timber and iron-ore), though such was the undeveloped state of the country that the full extent of these resources, even in the European part of Russia, was only just becoming known. Russia also possessed a vast home market, protected by an almost exclusive tariff wall, and large supplies of labour, but was handicapped by lack of capital and until the last years of the nineteenth century by the instability of her currency. The handicap of illiteracy was strongly felt both in agriculture and in the manufacturing industries. Great efforts were made to combat this in the country as a whole; illiteracy was reduced from 76 per cent. in 1913 to 49

per cent. in 1926, and to 19 per cent. in 1939. It may here be mentioned that one of the difficulties in describing the economic position of the European portion of Russia lies in the fact that the organisation of the country largely ignores the inter-continental frontier. The Russian Socialist Federated Soviet Republic, which is the main unit of the U.S.S.R., includes the whole of Siberia.

The aim of the "Five Year Plans," the first of which was inaugurated in 1928, was no less than to catch up and overtake the great industrialised countries of the world. An Industrial Revolution on an unprecedented scale was envisaged, not only to expand old industries, but also to develop entirely new industrial regions, and both in the shortest possible time. Moreover, it was required to avoid calling on the outside world for capital to finance the new development. The great changes in agriculture which accompanied this Industrial Revolution were a necessary corollary, because only by an Agricultural Revolution could sufficient labour be obtained for the expanded mining and manufacturing industries. In 1927 at least 75 per cent. of the population was engaged in agriculture and only 10 per cent. in industry. In addition to the ideological motives involved, the "collective" and "state" farms were devised to take the place of individual peasant-farming, because large mechanised farms would take less labour and would enable improved agricultural methods to be introduced more quickly than would have been possible by other means. It was eventually found necessary to obtain foreign equipment and to employ foreign technicians on a considerable scale, but the actual financing of the projects was an internal affair, though the latter involved an enormous amount of compulsory saving and of sacrifices, probably far greater than had been originally contemplated.

The first Five-Year Plan had a twofold aim: first, to expand heavy industry, which necessarily involved also a great increase in mining; secondly, to reduce the number of farmworkers by the "collectivisation" of agriculture. The second Five-Year Plan also aimed at industrial expansion, but embraced a greater variety of goods; in fact, it aimed avowedly at producing more "consumer" goods, previous emphasis on heavy industry having brought about a veritable famine in clothing, household goods, etc., as well as a temporary setback in agricultural productivity, and the result had been a period of very severe rationing. The third Five-Year Plan was interrupted by war; the fourth Five-Year Plan (1946-50) is now under way.

It is clear that the Plans achieved their object of putting the U.S.S.R. in the forefront of the world's producers as regards mining, manufacture, and production from the soil.

The mineral wealth of the U.S.S.R. has been found to be enormous, and no doubt large areas still await geological exploration. The endowment in fuel and power is vast. The reserves of coal are believed to be second only to those of the U.S.A.¹ In output of coal, the U.S.S.R. ranked fourth in 1938, with 132 million tons, and the output rose to 166 million tons in 1940, and to 250 million tons in 1950. The pre-war production and reserves of the principal coalfields are given below.

MILLION TONS

| | Donetz | Kuzbas | Ural | Tula | Far East | Karaganda |
|----------------|--------|---------|-------|--------|----------|-----------|
| Output, 1938 . | 80 7 | 20 0 | 8 1 | 7 4 | 4 7 | 3.9 |
| Reserves . . | 89,000 | 450,000 | 7,000 | 12,000 | ? | 53,000 |

As regards petroleum, the U.S.S.R. is the second world producer with reserves believed to equal those of the U.S.A. Output was 29 million tons in 1938 and 38 million tons in 1941. In water-power the natural endowment is not accurately known, but only about 12 per cent. of the country's electrical power is derived from water. Peat and lignite, mainly converted into electricity, are other important sources of power.

The wealth in metals is large and varied. The output of iron-ore was 27 million tons in 1938, of which 16 million tons came from the Krivoi Rog mines and 7.7 million tons came from the Urals. As regards manganese (required in the manufacture of steel), the U.S.S.R. ranked as first world producer; the ore coming almost wholly from Nikopol in the Ukraine and from Chiatura in Georgia. The country is also the largest world producer of chrome-ore (used chiefly for hardening steel) and of magnesite, now used chiefly as an alloy, *e.g.* in duralumin; both ores come mainly from the Urals. The U.S.S.R. is fortunately placed as regards gold and platinum. No production figures of gold are published; foreign estimates give about five million ounces as a probable figure. The chief production areas are in Eastern Siberia and the Urals. Platinum comes mainly from near Nizhni Tagil in the Urals, the U.S.S.R. competing with Canada for first place as producer. The U.S.S.R. also comes second to Canada in the production of asbestos (from the Urals), and to U.S.A. for phosphates (chiefly from the Kola apatite). The country is well supplied with materials used for making aluminium, particularly with nepheline, and to a less

¹ According to the Report of the 17th International Geological Congress, 1937, the total world reserves are about 7 billion tons, of which 3½ billion are in U.S.A. and 1½ billion in U.S.S.R.

extent with bauxite. Salt is also plentiful. On the other hand, the output of copper, lead, silver, nickel, and tin is insufficient, though further exploration may reveal new sources of supply. Tin is an outstanding deficiency. At present mining is still concentrated in a relatively few districts, particularly in the Urals and European Russia, and those sections of Russian Asia where transport is available.

The manufacturing industries of the U.S.S.R. are even more restricted to a few areas, mainly in the European section, including the Urals. The location of industry strongly reflects historic momentum, and in spite of the great devastation of the Ukraine during the war of 1941-45, and of the recent development of certain remote industrial regions in Asia, it seems that industry is destined to remain predominantly in the west of the U.S.S.R. for at least many decades. The four main manufacturing areas of the U.S.S.R. are: (1) the Moscow-Ivanovo area, (2) the Ukraine, (3) the Urals, (4) the Leningrad area. Far behind come the Asiatic centres of Kuzbas and Kazakhstan.

The greatest industrial advances since Revolutionary days have been made in the fields of heavy metallurgy and heavy engineering. The following table shows how the Russian world position has changed in regard to other large producing countries.

PRODUCTION OF PIG-IRON IN MILLION TONS*

| | 1880 | 1900 | 1913 | 1937 |
|---------------------------|------|------------|------|-------|
| Russia (U.S.S.R.) | ? | 5.8 (1899) | 4.2 | 14.6 |
| United Kingdom | 7.7 | 8.9 | 10.3 | 8.5 |
| Germany | 3.6 | 8.3 | 16.4 | 15.9 |
| France | 1.7 | 2.6 | 5.1 | 7.9 |
| U.S.A. | 3.9 | 13.7 | 30.9 | 37.7 |
| World total | 17.9 | 39.6 | 77.8 | 103.0 |

*For 1950 statistics, see Appendix D.

Heavy industry and engineering have not only undergone great expansion in output, but also in complexity of goods produced; moreover, entirely new areas have been developed, particularly in the Ural region, and to a less extent in the Kuzbas. Up to 1940, however, the Ukraine produced 65 per cent. of the pig-iron as against 22 per cent. for the Urals, and only 8 per cent. for the Kuzbas. Fine metallurgy and engineering continued to be located in the Leningrad and Moscow areas, and in some towns of the Ukraine. The manufacture of machinery and locomotives was also chiefly situated west of Siberia, though with some scattered centres in Asia.

The heavy chemical industry is almost entirely a development of the last 35 years, though it may be recalled that this industry has also been revolutionised and vastly expanded in Great Britain, Germany, and the U.S.A. during the same period. In the U.S.S.R. this industry is associated mainly with coal and salt (Ukraine), apatite (Kola), potassium and other salts (Solikamsk), and copper (Urals).

The old-established textile industry has undergone little expansion in its Moscow-Ivanovo home, but new textiles centres have been, and are being, set up in areas producing raw materials for the industry, particularly in Turkestan.

In 1938 the U.S.S.R. claimed first place in Europe and second in the world for its output of machinery, tractors, lorries; second place in Europe and third in the world for pig-iron, steel, electric power, and aluminium; and third place in Europe and fourth in the world for coal and cement. Yet on analysis these impressive totals are found to be not so remarkable when the huge area which supplies them is considered, the U.S.S.R. covering some eight million square miles as against three million for the U.S.A. Moreover, the production per worker and per head of population is less than in the older established countries. Modern Russian industry is still handicapped by inexperienced labour and direction as well as by the inadequate transport system, even in the European section of the country. Tarred or macadamised roads are very rare, while the railway network is very inferior to that of central and western Europe.

In agriculture the U.S.S.R. has an enormous aggregate output, and the same applies to timber, the only comparable single country being the U.S.A. though again the Russian production per head is smaller. Between 1913 and 1938 the total acreage under crops increased from 260 million acres to 338 million acres. A significant increase took place in the cultivation of (a) fodder crops (from 2 to 10 per cent. of the total area sown), (b) industrial crops, such as cotton, sugar-beet, tobacco, tea (from 4 to 10 per cent.), and (c) potatoes and other vegetables. The number of livestock, however, decreased. The greater part of the cropped land of the U.S.S.R. is still in Europe, only 7 per cent. of the whole country being under cultivation as against about a quarter of the European section.

It will be gathered from the above paragraphs that the "centre of gravity" of the U.S.S.R. still remains west of Asia. Although the European section has less than a third of the total area it has two-thirds of the total population, with a density of 50 per square

mile as against 21 for the whole country. The great urban¹ development associated with the Five-Year Plans chiefly affected the European section; whereas in 1926 there were only twenty cities with over 100,000 inhabitants, in 1939 there were eighty cities in that category, of which only sixteen were east of the Ural region.

A significant feature of the population trend in the U.S.S.R. was the high net rate of reproduction, which in the 1930's was 1.4 per hundred as against 0.75 for England. This means an increase of 40 or 50 per cent. within a generation, and with a decrease in the death rate, the U.S.S.R. expects to attain a population of 250 million within a few decades.

It seems inevitable that the U.S.S.R. will take more part in the affairs of Europe than she did before 1938, and it seems also probable that, with a rapid increase in population and industrial experience, the tempo of her developments in industry, agriculture, and transport will accelerate. At the present time the country seems to be suffering from similar rawness and "growing-pains" to those experienced in the middle of the last century by the U.S.A.² Difficult as it would have been then to forecast the development of U.S.A. as the world's leading industrial power, so it is equally rash at the present day to attempt to forecast the main lines of development of the U.S.S.R.

The external trade of the U.S.S.R. does not reach high figures, partly because the government aims at economic self-sufficiency and partly because the country is so vast and diverse that the most varying needs can be supplied internally.

REFERENCES

On Russian history, *A Survey of Russian History*, by B. H. Sumner (1944), and *Russia, a Short Cultural History*, by D. S. Mirsky (London, 1942), can be recommended. On the trends of modern Russian life, *The Russian Peasant and Other Studies*, by Sir John Maynard (London, 1942), provides a wealth of vivid pictures; see especially Chap. XV, "The End of Small-scale Agriculture," Chap. XVI, "Collective Farm," and Chap. XVII, "Urban Labour." See also, U.S.S.R., *Her Life and People*, by Maurice Dobb (London, 1943), and the same author's *Soviet Economic Development since 1917* (London, 1948). Other books that are recommended include: L. S. Berg, *Natural Regions of the U.S.S.R.*, (London and N.Y., 1950); G. Jorré, *The Soviet Union: the Land and its People* (London, 1950); T. Shabad, *Geography of the U.S.S.R.* (New York, 1951).

On population, see *The Population of the Soviet Union*, by Frank Lorimer (Geneva, 1946), "Trend of Population and Labour Problems of the U.S.S.R.," by A. Baykov, in *Jour. of Roy. Stat. Society*, Vol. CVI, Part IV, 1943, and "The Balance of Births and Deaths," by R. R. Kuczynski, in *Geography*, March, 1937.

¹ Urban population increased from 18 per cent. in 1926 to 33 per cent. in 1939.

² See Dickens' *American Notes*.

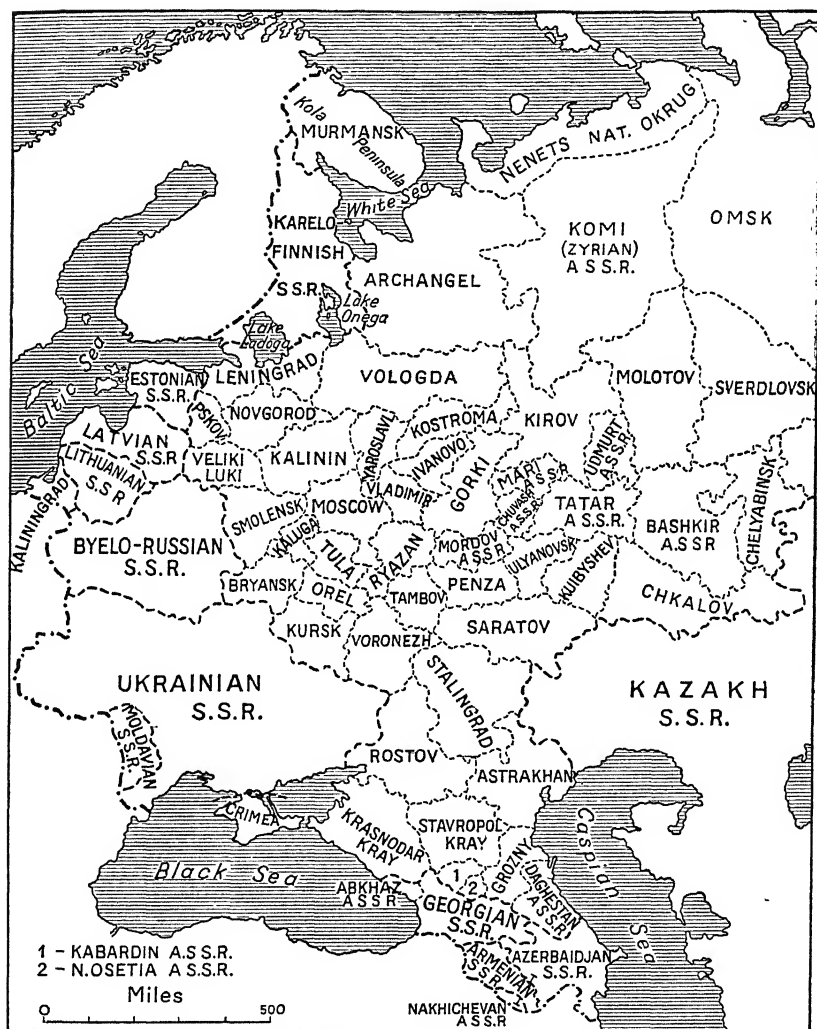


FIG. 153. ADMINISTRATIVE DIVISIONS OF EUROPEAN SECTION OF U.S.S.R., 1948.

APPENDICES

APPENDIX A

| Country | Area in Square Miles | Population | Date of Census or other Enumeration | Population per Square Mile |
|---------------------------------|----------------------|-------------|-------------------------------------|----------------------------|
| Albania | 10,629 | 1,200,000 | Estimate 1951 | 113 |
| Austria | 32,376 | 6,881,100 | Census 1951 | 209 |
| Belgium | 11,755 | 8,639,000 | Estimate 1950 | 735 |
| Bulgaria | 42,796 | 7,310,000 | Estimate 1951 | 171 |
| Czechoslovakia | 49,358 | 12,340,000 | Estimate 1950 | 250 |
| Denmark | 16,550 | 4,281,275 | Census 1950 | 259 |
| Finland | 130,125 | 4,032,538 | Census 1950 | 31 |
| France ¹ | 212,600 | 41,944,000 | Estimate 1950 | 197 |
| Germany ¹ | 136,343 | 69,000,000 | Estimate 1951 | 506 |
| British Isles | | | | |
| { England and Wales | 58,343 | 43,744,924 | Census 1951 | 750 |
| { Scotland | 30,411 | 5,095,969 | Census 1951 | 168 |
| { N. Ireland | 5,451 | 1,370,709 | Census 1951 | 251 |
| { Eire | 27,000 | 2,958,878 | Census 1951 | 110 |
| Greece | 51,200 | 7,960,000 | Estimate 1950 | 155 |
| Hungary | 35,902 | 9,390,000 | Estimate 1951 | 262 |
| Iceland | 39,709 | 144,263 | Census 1950 | 3 6 |
| Italy | 116,235 | 46,737,704 | Census 1951 | 402 |
| Netherlands | 12,450 | 10,114,000 | Estimate 1950 | 812 |
| Norway | 124,556 | 3,277,000 | Census 1950 | 26 |
| Poland | 121,131 | 24,976,926 | Census 1950 | 206 |
| Portugal | 35,466 | 8,490,455 | Census 1950 | 239 |
| Romania | 91,584 | 16,200,000 | Estimate 1951 | 177 |
| Spain | 189,400 | 27,976,755 | Census 1950 | 148 |
| Sweden | 173,035 | 7,044,039 | Census 1950 | 41 |
| Switzerland | 15,900 | 4,714,992 | Census 1950 | 297 |
| Turkey-in-Europe | 9,250 | 1,626,229 | Census 1950 | 176 |
| U.S.S.R. ² | 8,400,000 | 193,200,000 | Estimate 1946 | 23 |
| Yugoslavia | 95,558 | 16,148,000 | Estimate 1950 | 176 |

¹ Excluding the Saar.

² Includes Asiatic as well as European section.

Statistics mainly from the United Nations, *Demographic Yearbook*, 1952.

APPENDIX B

COAL PRODUCTION.—Metric Tons (in thousands)

| Country | 1928 | 1937 | 1950 |
|--------------------------------|---------------------|----------------------|------------------------|
| Austria | 202 | 230 | 183 |
| Belgium | 27,587 | 29,681 | 27,304 |
| Bulgaria | 70 | 120 | ? |
| Czechoslovakia | 14,560 | 16,951 | 18,456 |
| France | 51,780 | 44,319 | 50,843 |
| Germany ¹ | 180,861 | 184,513 | 125,846 |
| Hungary | 783 | 917 | 1,400 ² |
| Italy | 128 | 969 | 1,031 |
| Netherlands | 10,920 | 14,321 | 12,247 |
| Poland | 40,616 | 36,218 | 73,011 |
| Portugal | 201 | 283 | 426 |
| Romania | 298 | 304 | 300 |
| Spain | 6,371 | 5,289 (1938) | 11,042 |
| Spitzbergen | 279 | 784 (1936) | 364 ³ |
| Sweden | 359 | 460 | 309 |
| United Kingdom | 241,283 | 245,053 | 219,795 |
| U.S.S.R. | 35,808 ⁴ | 127,000 ⁴ | 250,000 ^{4,5} |
| Yugoslavia | 357 | 428 | 1,154 |

¹ Including the Saar. Western Germany only in 1950, when Saar production was 5 million tons.

² Estimate.

³ From Norwegian mines only.

⁴ In the whole of U.S.S.R.

⁵ Including lignite. 1951 estimate 284,000.

LIGNITE PRODUCTION.—Metric Tons (In thousands)

| Country | 1928 | 1937 | 1950 |
|--------------------------|---------|---------|---------------------|
| Austria | 3,263 | 3,242 | 4,308 |
| Bulgaria | 1,361 | 1,732 | 5,712 ¹ |
| Czechoslovakia | 20,451 | 18,042 | 27,506 |
| France | 1,075 | 1,015 | 1,686 |
| Germany | 165,588 | 184,672 | 75,841 ² |
| Hungary | 6,510 | 8,055 | 11,850 |
| Romania | 2,630 | 1,879 | c. 2,900 |
| Yugoslavia | 4,694 | 4,574 | 11,712 |

¹ Including coal.

² Western Germany only. The four former occupied zones in 1947: 160,596.

Production figures mainly from the following: *The Mineral Industry*, ed. G. A. Roush, Annual, New York and London; *Minerals Yearbook*, U.S.A. Government Printing Office, Annual, Washington, *Monthly Bulletin of Statistics* (Statistical Office of the United Nations), Lake Success, N.Y.; *United Nations Statistical Yearbook*, 1952.

APPENDIX C

IRON-ORE PRODUCTION.—Metric Tons (in thousands)

| Country | 1928 | 1937 | 1950 |
|--------------------------|--------------------|---------------------|---------------------|
| Austria | 1,928 | 1,885 | 1,859 |
| Czechoslovakia | 1,779 | 1,836 | 1,600 ¹ |
| France | 49,191 | 37,839 | 30,203 |
| Germany | 6,296 | 9,575 | 10,882 |
| Hungary | 200 | 290 | 368 |
| Italy | 641 | 998 | 442 |
| Luxembourg | 7,027 | 7,766 | 3,845 |
| Norway | 531 | 1,008 | 430 ² |
| Poland | 737 | 780 | 790 |
| Spain | 5,785 | 990 | 2,079 |
| Sweden | 4,669 | 14,953 | 13,927 |
| United Kingdom | 11,443 | 14,443 | 13,145 |
| U.S.S.R. | 6,024 ³ | 26,000 ³ | 29,000 ⁴ |
| Yugoslavia | 440 | 629 | 800 ¹ |

¹ Estimate.³ In whole of U.S.S.R.² Excluding titaniferous iron-ore.⁴ Estimated 1947 production.

APPENDIX D

WORLD DEVELOPMENT OF HEAVY INDUSTRY AS SHOWN IN PRODUCTION OF
PIG IRON
(Million Tons)

| Country | 1880 | 1900 | 1913 | 1937 | 1950 ¹ |
|-------------------------------|---------|-----------|---------|----------|-------------------|
| United Kingdom | 7.7 | 8.9 | 10.2 | 8.5 | 9.8 |
| U.S.A. | 3.9 | 13.7 | 30.9 | 37.7 | 60.2 |
| Germany | 3.6 | 8.3 | 16.4 | 15.9 | 9.8 ² |
| France ³ | 1.7 | 2.6 | 5.1 | 7.9 | 7.8 |
| U.S.S.R. | ? | 5.8(1899) | 4.2 | 14.6 | 19.5 ⁴ |
| All others | c. 1.1 | c. 6.5 | c. 11.0 | c. 18.4 | c. 25.9 |
| World total | c. 18.0 | c. 40.0 | c. 77.8 | c. 103.0 | c. 133.0 |

¹ 1950 Figures include ferro-alloys which are, however, usually small in amount. The total world production of ferro-alloys in 1937 was c. 2 million tons.

² 9.5 Million tons in the three Western Zones and 0.3 in the Soviet Zone.

³ Excluding the Saar production which, in 1950, was 1.7 million tons.

⁴ Estimate.

APPENDIX E

VITAL STATISTICS
AVERAGES 1931-35 and 1947-50

| | Birth Rate per thousand | | Death Rate per thousand | | Natural Increase per thousand | |
|-------------------------------|----------------------------|---------|----------------------------|---------|----------------------------------|---------|
| | 1931-35 | 1947-50 | 1931-35 | 1947-50 | 1931-35 | 1947-50 |
| Albania | 30.2 | — | — | — | — | — |
| Austria | 14.4 | 17.2 | 13.5 | 12.6 | 0.9 | 4.6 |
| Belgium | 16.8 | 17.2 | 12.9 | 13.0 | 3.9 | 4.2 |
| Bulgaria | 29.3 | 24.0 | 15.5 | 13.4 | 13.8 | 10.6 |
| Czechoslovakia . . | 19.6 | 23.2 | 13.8 | 11.8 | 5.8 | 11.4 |
| Denmark | 17.7 | 19.0 | 10.9 | 9.1 | 6.8 | 9.9 |
| Eire | 19.4 | 21.9 | 14.0 | 13.1 | 5.4 | 8.8 |
| Finland | 19.5 | 26.0 | 13.4 | 11.0 | 6.1 | 15.0 |
| France | 16.5 | 21.7 | 15.7 | 12.9 | 0.8 | 8.8 |
| Germany | 16.6 | — | 11.2 | — | 5.4 | — |
| Eastern ¹ . . . | — | — | — | — | — | — |
| Western ¹ . . | — | 16.7 | — | 10.7 | — | 6.0 |
| Greece | 29.5 | 26.6 | 16.5 | 10.8 | 13.0 | 15.8 |
| Hungary | 22.5 | 19.7 | 16.0 | 12.0 | 6.5 | 7.7 |
| Iceland | 23.5 | 27.8 | 11.1 | 8.2 | 12.4 | 19.6 |
| Italy | 23.8 | 20.8 | 14.1 | 10.5 | 9.7 | 10.3 |
| Luxembourg . . . | 16.9 | 14.6 | 12.4 | 12.1 | 4.5 | 2.5 |
| Netherlands . . . | 21.2 | 24.8 | 8.9 | 8.8 | 12.3 | 16.0 |
| Northern Ireland . | 20.0 | 21.8 | 14.3 | 11.7 | 5.7 | 10.1 |
| Norway | 15.2 | 19.7 | 10.4 | 9.1 | 4.8 | 10.6 |
| Poland | 27.6 | 22.7 | 14.6 | 11.2 | 13.0 | 11.5 |
| Portugal | 29.1 | 25.3 | 17.0 | 13.1 | 12.1 | 12.2 |
| Romania | 32.8 | 22.4 | 20.6 | 21.1 | 12.2 | 1.3 |
| Spain | 26.9 | 21.5 | 16.2 | 11.4 | 10.7 | 10.1 |
| Sweden | 14.1 | 17.8 | 11.6 | 10.2 | 2.5 | 7.6 |
| Switzerland . . . | 16.4 | 18.7 | 11.8 | 10.7 | 4.6 | 8.0 |
| United Kingdom ² . | 15.5 | 18.0 | 12.2 | 11.7 | 3.3 | 6.3 |
| U.S.S.R. | 33.0 | 25.0 | 22.0 | 10.0 | 11.0 | 15.0 |
| Yugoslavia . . . | 31.8 | 29.2 | 17.9 | 13.3 | 13.9 | 15.9 |

¹ 1945-49.

— Not available.

² The figures for the United Kingdom include those for Northern Ireland, which, however, are also given separately.Source: United Nations, *Demographic Year book*, 1951, and national statistics.

APPENDIX F

TABLE OF GEOLOGICAL SEQUENCES

| <i>Era</i> | <i>Period or System</i> |
|-----------------------------|--|
| Quaternary | { Recent Pleistocene |
| Tertiary or Kainozoic . . . | { Pliocene Miocene Oligocene Eocene |
| Secondary or Mesozoic . . . | { Cretaceous Jurassic (Liasic) Triassic |
| Primary or Palæozoic . . . | { Permian Carboniferous Devonian Silurian Ordovician Cambrian |
| Archæan or Pre-Cambrian. | |

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